STANDARDIZED DESIGN PROCESS AND CAPITAL PLANNING FOR SALVATION ARMY CORPS COMMUNITY CENTERS: A CASE STUDY AND RECOMMENDATIONS

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For Jennifer

On December 29, 1990 God tipped the scales of success in my favor by blessing me with you, my best friend, my supporter and encourager. You make me more than I could ever be alone. Thank you for being my life partner, the perfect mother to our sons, and for sometimes taking the 'dad' role in my absence during the past three years. You are my angel 'awares."

For Brandon and Dylan

My two boys are the living, breathing, walking dreams of a father. Because you both emulate everything I do, you forced me to strive for excellence. Keep watching your Dad because no less will be expected of you…and another, if one comes.

For Mom and Dad

Thank you for teaching me things I didn't even know I was learning until I had children of my own. Sometimes I find myself sounding just like you and guess what…it makes me proud. Even more than that, thank you for praying me through every day of my life.

For Chuck and Jackie

In case you haven't noticed, you guys are more than friends…you're family. Thanks for being there every time I needed you. When we laugh, we laugh hard. When we cry…well when Jackie cries, she cries hard enough for us all. When this is finally over, let's have some fun.

For John R. Jones, Jr.

Thanks for giving me my start in this business and for teaching me two very important lessons. First, you don't have to have all the answers…just know where to find them. Second, attitude is everything, and with the right attitude any job can be fun.

For Brent and Susan

You are professionals that any successful business person should emulate. Thanks for teaching me the design and construction business, for providing the perfect advice when I needed it, for mentoring me, but most of all for being my friends and loving my family like your own.

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It seems to be a rare occurrence that a person is able to perform occupational tasks that bring true fulfillment, excitement, and a sense of meaning and accomplishment. The Salvation Army allows me that opportunity on a daily basis as I perform my professional responsibilities of consultative services regarding real estate and construction at the corporate level. Because I am fully aware that the facilities we construct and operate change lives through our mission, I take my role very seriously and strive to perfect those facilities so that our ministry is effective.

The members of The Salvation Army Southern Territory Cabinet have supported my educational pursuits financially, but more importantly, through prayer and encouragement. As the body of this document will evidence, they have allowed me to experiment and test building designs, systems, and components in order to develop a prototype, and have allowed me to go beyond simply theorizing about these elements…they actually let me build one.

For the challenge, experience, pressure, and accountability of this research project, I express my appreciation and acknowledge that I am indeed fortunate to be a part of this organization. It is with gratitude that I recognize the Cabinet's assistance and their endorsement of my educational and professional endeavors. May I continually prove myself worthy of their support.

"I can do all things through Christ who gives me strength."

Philippians 4:13

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SUMMARY

The Salvation Army, a non-profit Christian Church and social service enterprise, struggles as all corporations do, with expending limited resources in the most efficient and effective manner. The Salvation Army has been recognized as a corporate leader in effectively managing administrative and programmatic resources and generating positive results in their programs designed for the benefit of society and the community of mankind as a whole. This document focuses on whether The Salvation Army's practices concerning the design, construction, and operation of facilities warrants the same praise regarding efficiencies and effectiveness.

The contents of this thesis are an evaluation of, and recommendations for, the design and construction processes used by The Salvation Army's Corporate Headquarters to construct and operate Salvation Army Corps Community Centers throughout the southeastern United States. The primary objectives were to analyze the current design and construction processes, develop a prototype design, and determine through quantitative research if standardization of the design is cost effective, programmatically functional, superior in terms of constructability, maintainability, sustainability, and if and how a standard model should be implemented.

The methodology used to produce this thesis included a comprehensive review of relevant literature concerning current industry standards regarding design and construction to develop an understanding of the advantages and disadvantages of standardized design. Personal interviews with architects and directors of similar facilities were conducted to gain a thorough knowledge of the concept of standardization.

A survey was distributed to internal personnel involved in the design, construction, and operations of Salvation Army Corps Community Centers. The survey was used to determine the experience, expertise, and limitations of those individuals and how the internal population views and implements current processes, as well as their opinion of standardization.

In concert with a standard design, an integrated operations, maintenance, capital renewal plan, and emergency plan concept is discussed, produced, and incorporated into an actual constructed model. An implementation plan for each of the components mentioned above is also provided.

The information gleaned from the research indicated that process improvement was warranted and that a standardized design could effectively "jump start" the design process which would ultimately result in cost savings, production of a programmatically functional facility that is cost effectively maintained, built from sustainable products, and incorporates an operations, maintenance and capital renewal plan as well.

While the research conducted supports the implementation of a standardized design, operations, and capital renewal plan, further research will be conducted to evaluate the effectiveness of the implemented program. By studying the constructed model, adjustments can be made in the process and practice to further improve the efficiency and effectiveness of the standardized design process, operations, maintenance, and capital renewal plan.

CHAPTER 1 - INTRODUCTION

In the book *The Most Effective Organization in the U.S.* by Robert Watson (2001), Dr. Peter F. Drucker states "The Salvation Army is by far the most effective organization in the U.S. No one even comes close to it with respect to clarity of mission, ability to innovate, measurable results, dedication, and putting money to maximum use." In the same publication Ross Perot offers that, "The Salvation Army is one of our most trusted, successful, and cost effective organizations whose mission is to help other people." These two successful and highly regarded businessmen verbally reflect the success of this organization in a broad operational and programmatic sense. As a facilities manager and property consultant at the corporate (territorial) level, I propose to extract Drucker's assertion of "putting money to maximum use," and Perot's "cost effective" claim and test them against The Salvation Army's current facility design, operations, and capital planning functions to see if those observations apply to these processes as well. The study will focus specifically on the construction of Salvation Army churches, known internally as Corps Community Centers, to determine if process improvement is warranted and what cost benefits may be derived if implemented.

1.1 What is The Salvation Army?

The Salvation Army's 2004 Yearbook describes the organization as "an integral part of the Christian Church, although distinctive in government and practice. The Army's doctrine follows the mainstream of Christian belief and its articles of faith emphasize God's saving purposes. Its objective is the advancement of the Christian religion…and pursuant thereto, the advancement of education, the relief of poverty, and other charitable objects beneficial to society or the community of mankind as a whole.

The Salvation Army was founded in London England in 1865 by William Booth. In order to rapidly advance the mission of the Army and deploy personnel, The Salvation Army adapted a quasi-military command structure. Responding to a recurrent theme in Christianity which sees the church engaged in spiritual warfare, the Army uses, to its advantage, certain soldiery features such as uniforms, flags, and ranks to identify, inspire, and regulate its endeavors" (2004).

The evangelistic and social enterprises of the Army are performed, under the authority of the General, by full-time paid officers and employees, as well as soldiers (church members) who volunteer their service. The Army also garners support from philanthropic benefactors and local boards comprised of volunteers who serve in an advisory capacity. Leadership in the Army is provided by commissioned officers who are recognized as ordained ministers of religion.

"Raised to evangelize, the Army spontaneously embarked on schemes for the social betterment of the poor. Wherever the Army operates, evolving social services meet endemic need through practical, skilled and cost-effective ways using up-to-date facilities and highly-trained staff. The Salvation Army is part of the worldwide Christian Church. It was called into existence to save souls, to grow saints and to serve suffering humanity" (The Salvation Army Yearbook 2004).

1.2 The Salvation Army's World-Wide Structure

The Salvation Army currently provides services in practically every part of the world. The areas where Salvation Army services are provided are as follows: Africa, Americas and Caribbean, Europe, South Asia, and the South Pacific and East Asia. Figure 1.1 graphically depicts those areas of service.

Figure 1.1 Salvation Army World Map
The Salvation Army 2004 Yearbook

Within each of the previously mentioned world-wide areas of service, The Salvation Army sub-divides the regions into Territories. Each Territory is somewhat autonomous and in America, each Territory is legally recognized as a separate corporation. The United States is divided into four Territories; the Eastern Territory which comprises the northeastern section of the U.S.; the Central Territory made up of the northern midsection of the U.S.; the Western Territory which includes the western section of the U.S.; and the Southern Territory which incorporates the 15 southern states and the District of Columbia. The corporate headquarters for The Salvation Army's Southern Territory is located in Atlanta, Georgia. The Southern Territory is the subject of this document and is graphically depicted in Figure 1.2.

Figure 1.2 U.S.A. Southern Territory Map

1.3 Current Statistical & Financial Overview

The Salvation Army currently conducts business and provides services in 109 countries utilizing 175 different languages in order to affect its ministry. To provide a frame of reference, Table 1.1 shows a sampling of the current type and level of service the Army administers on selected services worldwide and compares that against what is provided by The Salvation Army's Southern Territory. This illustrates the magnitude of the Army's reach on a worldwide and regional basis. Some specific programs offered by The Salvation Army in the Southern Territory include church and community center programs, alcohol and drug recovery programs, social service case work and temporary residential housing, camping and music conservatory programs, licensed day care services, Boys' and Girls' Clubs, thrift stores, and other crisis and preventive programs. The modernization of services and long-term development are under continual review in order to meet the needs of humanity.

Table 1.1 Comparison of Selected Services Worldwide to USA Southern Territory

		USA		
		Southern		***Percent***
Type Of Service	***Worldwide***	***Territory***	***Variance***	***Variance***
Corps Community Centers & Clubs	15,339	516	14,823	3.36%
Day Care Centers (Adult & Children)	1,636	41	1,595	2.51%
Social Service Centers (Residential)	1,790	311	1,479	17.37%
Thrift Stores	1,575	457	1,118	29.02%
Personnel				
Officers	17,346	954	16,392	5.50%
Employees	109,897	16,000	93,897	14.56%
Total Personnel	127,243	16,954	110,289	13.32%

Data from USA Southern Territory Disposition of Forces – November 2004

Financial data gathered from the audited consolidated financial statement for fiscal year ended September 30, 2003 indicates corporate assets for the Southern Territory of $2.2 billion. Of the assets reported, $930 million, or 42% of the corporate balance sheet is represented as land and buildings with $136 million identified as construction in progress. The enormity of these figures, as well as the trust, accountability and fiduciary responsibility inherent with the acceptance of public and private donations, compel the organization to explore and identify new ways to incur efficiencies and enhance services.

1.4 Organizational Culture

The Salvation Army's use of a quasi-military management structure suggests a very rigid, top-down, corporate leadership chain. The Southern Territory, as a corporation, employs a three tiered management structure that has as its top the corporate headquarters, followed by a state or division headquarters, followed by a local or area command. At each of these levels there is a single leader who represents the Army's interest and to which all other Army entities beneath him or her report. Each of these tiers has decision-making powers delegated to a certain level, typically financial limits.

Once those limits are exceeded, the decisions have to be made at a higher level. With regard to items such as property purchases and sales, leases, architect and contractor agreements, and new construction, decisions are recommended from the source of origin such as the local or state level, but must be approved at the corporate level.

Like with most corporations, state and local decision-makers sometimes view corporate headquarters as a necessary nuisance. Because they are intimately more familiar with the complexities of the local situations, local leadership, at times, would prefer limited involvement from the corporate level. With that in mind, the suggestion of a standard design model pushed downward is met with some resistance. The current culture, coupled with the normal human innate resistance to change makes the prospect of standardization tenuous without proper quantitative and qualitative proof that change is warranted. If the data suggest a standards program will improve the process, it is only through careful planning, and the inclusion of local entities at each stage of development, that the implementation of such a program will be successful.

What follows is an examination of current design, operations, and capital planning for recently constructed Salvation Army Corps Community Centers (churches). Based on the results of the examination, recommendations for streamlining the process and properly identifying necessary capital investment for maintaining these facilities at optimum levels will be provided. Further, a model design for constructing a facility that is programmatically functional, maintainable, and sustainable will be developed.

CHAPTER 2 - CURRENT PROCESSES, RESULTS & RECOMMENDATION

The Salvation Army's corporate headquarters has responsibility for the capital program throughout the southeastern United States. Capital program management is a centralized function, while individual project management is a hybrid centralized/decentralized function with most of the project planning, budgeting, design, and delivery system procurement initiated and executed at the local level. Once developed locally, the project components are then forwarded to corporate headquarters for review, and if all the prescribed policy criteria are met, the project is approved.

Although similar in scope and use, the current project management system requires total redesign of newly constructed facilities for each individual project. It is my assumption that this process equates to inefficiencies with regard to design and construction costs, delivery time, and program requirements of the facility.

2.1 Southern Territory Project Volume

The Salvation Army Southern Territory maintains, on average, 135 to 145 active construction and renovation projects of varying use and scope at any given time. Projects are defined by the Territory as renovations or new construction in excess of $100,000. The total budget for these projects exceeds $200 million with contractor payments ranging from $75 million to $90 million annually. Of the 135 to 145 projects, approximately 10%, or about 14 projects, are Corps Community Centers.

2.2 Corps Community Center Description and Sampling of Completed Projects

As previously mentioned, Corps Community Centers are Salvation Army worship centers or churches. A typical Corps Community consists of a chapel, a classroom or

education wing, a multi-purpose or community room with a light commercial kitchen, an administrative wing, a gymnasium, and typical support areas such as storage and mechanical rooms and janitor closets. Each center will vary in size depending upon local needs and conditions as well as the availability of capital funding.

A study of ten recently completed Corps Community Center projects in the Southern Territory was conducted with "recent" being defined as a project with final completion having been realized within the last 5 years. The data was extracted from The Salvation Army's internal *Territorial Project Management System* database and will be used throughout this document as a comparison against industry norms. That comparison will then be used to determine if changes in the design process are warranted in order to reduce design and construction costs.

The study indicated an average of 22,327 square feet per project with and average total construction cost of $2.8 million or $126.89 per square foot. The total cost and square footage for each Corps Community Center project is shown in Table 2.1.

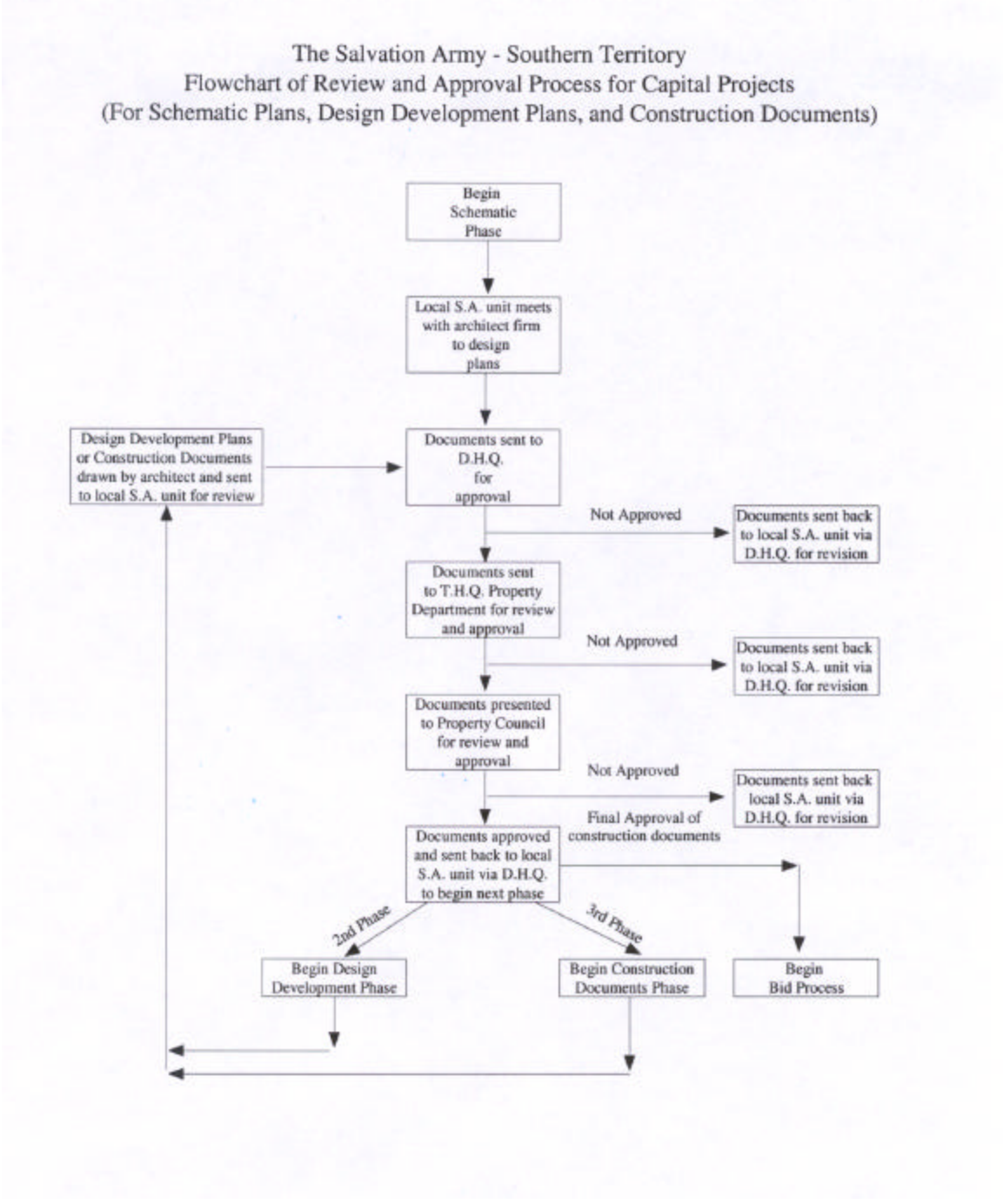
Table 2.1 Corps Community Center Construction Cost & Square Footages

Project Number	***Total Construction Cost***	***Total Square Feet***	***Cost Per Square Foot***
1	$3,166,570	21,767	$145.48
2	3,607,065	28,300	127.46
3	2,576,104	25,842	99.69
4	1,571,323	13,736	114.39
5	2,270,381	22,407	101.32
6	6,731,379	38,323	175.65
7	2,096,563	17,868	117.34
8	1,354,170	10,664	126.99
9	2,121,929	21,900	96.89
10	2,837,449	22,460	126.33
Total	***$28,332,933***	***223,267***	***N/A***
Averages	***$2,833,293***	***22,327***	***$126.89***

2.3 The Current Design Process

Upon corporate approval of a capital project, the current design/bid/build or design/build process requires Salvation Army officers, professional staff, and advisory board members at the local level to interview and select a design firm in their particular geographic location to design the facility. Once the firm is selected, a liaison from corporate headquarters meets with the appropriate local representatives to discuss The Salvation Army's design requirements and construction project policies and protocol. This procedure is known as a pre-schematic meeting.

The pre-schematic meeting is conducted in order to address issues relative to the project and provide answers to specific questions that may be raised by the architect or local project participants. Typical issues addressed include floor plan requirements for particular program components, interior/exterior finish specifications, program security and control concerns, square footage requirements for programs to be conducted in the facility, architect fees and the construction budget. It is also strongly recommended that the local Salvation Army representative, prior to beginning design work, submit a written program of facility requirements to the architect. Upon execution of the formal architect's agreement, the architect may begin the formal design of the proposed facility. The design review process incorporates the three standard phases of design documents (schematic, design development, and construction documents) and requires approval in sequential order by local, state/divisional, and territorial levels. The current design review process is shown in Figure 2.1.



Legend: S.A. - Salvation Army
DHQ - Divisional (State) Headquarters
THQ – Territorial Headquarters

Figure 2.1 Design Review Process Flowchart

Architect agreements for the ten Corps Community Centers studied indicated a time budget for design services for all three required phases of design documents was 180 days and was distributed as follows:

Design Time Budget:

Schematic Phase	90 Days
Design Development Phase	60 Days
Construction Documents Phase	30 Days
Total Design Phase	**180 Days**

Architect agreements for the ten Salvation Community Center projects studied indicated a range of between 5% and 9% of construction cost with the average being 6.70%. This information is shown for each individual project in Table 2.2.

Table 2.2 Architect Fees as Percent of Construction

Project Number	***Total Construction Costs***	***Architect Fees***	***Architect Fees As % of Construction***
1	$3,166,570	$161,597	5.10%
2	3,607,065	185,109	5.13%
3	2,576,104	205,561	7.98%
4	1,571,323	86,999	5.54%
5	2,270,381	114,000	5.02%
6	6,731,379	601,921	8.94%
7	2,096,563	105,753	5.04%
8	1,354,170	81,987	6.05%
9	2,121,929	137,276	6.47%
10	2,837,449	219,089	7.72%
Total	***$28,332,933***	***$1,899,293***	***N/A***
Averages	***$2,833,293***	***$189,929.27***	***6.70%***

It is important to point out that The Salvation Army does not, as part of the contractual process, assess monetary penalties for the architect's failure to produce design documents per the design time budgets. Further, while the design time alone does not adversely affect costs, the time lost in construction caused by design delays has a major

impact on the construction costs of the project due to the inflationary nature of construction labor and materials.

In attempting to determine if the current design process is time inefficient, a benchmark, or industry standard, must be identified in order to compare Salvation Army design time realities to industry norms. Mr. Brent Pope, Owner, Principal Architect and President of Pope/Partners Architects, Inc. and Salvation Army architectural consultant and designer for over 25 years states that "design time for church/community centers of the size, scope, and conservative nature The Salvation Army constructs typically should take an experienced architectural firm no more than 120 to 180 days to complete" (2002). The data compiled using the ten projects previously described had an average design time from schematic phase to construction document phase of 506 days as shown in Table 2.3. This is 326 days in excess of the norm or approximately three times the amount of time it should take for design functions.

Table 2.3 Dated Design Document

Project Number	***Schematic Design Approved***	***Construction Documents Approved***	***# Days Schematic/ Construction***
1	17-Sep-97	12-Jan-99	482
2	15-Dec-98	21-Jan-00	402
3	07-Jan-97	29-Mar-99	811
4	23-Jun-00	25-Apr-01	306
5	14-May-01	24-Apr-02	345
6	15-Feb-99	06-Mar-00	385
7	03-Jul-01	24-Apr-02	295
8	20-Jun-00	08-May-01	322
9	15-Dec-98	13-Apr-99	119
10	15-Feb-94	23-Jun-98	1,589
		Averages Days	***506***

2.4 What are the Reasons for Design Time Delays?

The current design process begins at the local level and is initiated and managed in many cases by Salvation Army representatives who have little or no design and construction project management experience. A survey was conducted to determine the experience level of Salvation Army officer personnel with design and construction projects. The survey population included 100% of Salvation Army officers at the Corps Community Center level in the Southern Territory. The number of surveys sent was 322 and 50 responses were received for a response rate of 16%. Of the responses received, 60% had never participated in the process of constructing a Corps Community Center. Further, of those responding, 96% of the locations had no professionally trained staff to manage a Corps Community Center design and construction project on behalf of the owner. Based on those results it can be inferred that delays, to some extent, would occur simply due to the inexperience level and lack of professional leadership of the local team. The survey and the results, which will be used in other parts of this document, can be reviewed in Appendix A.

Further complicating the process is the multiplicity of functions the Army operates in Corps Community Centers. While many architects have experience in church, social service offices, or community center design as individual buildings, few have experience in combining these functions into a single facility. The multiple use facility the Army needs brings inherent control and programmatic concerns to the forefront. While written programs provided to the design team are helpful, it is rare that they are produced prior to design, and even when they are, they are not specific or clear enough so as to provide the architect a clear understanding of the intended use of the facility. This would again reflect the inexperience of both the Army representatives and the architect.

Another cause in time delay is the review process itself (see Figure 2.1). According to Major John R. Jones, Jr., former Territorial Property Secretary responsible for all Salvation Army construction in the Southern Territory, "Because the drawings must be reviewed and approved at a minimum of three levels, best case scenario would be that the drawings are processed and approved, once presented, in a three week period. And because the territorial level allows for two weeks for reviewing the documents, a month passes before the architect is authorized to move to the next phase of design. If you add in the additional time for any recommended design changes based on observations made at any level of review, it is easy to see how the design time can escalate to frustrating levels that ultimately impact the project in a negative manner…specifically cost" (2004).

Finally, design delays can occur because design elements were included, as recommended by the architect and/or the local Army representative, without regard to the construction budget and available funding sources…or lack thereof. Without proper administrative guidance during the design phase, it is easy to get "carried away" only to reach the end of the process and not be able to afford to construct the desired design.

All of the above issues: inexperience, the multi-leveled review and approval process, the lack of a clearly written program, and ignoring the budget all have an affect on design time and cost. The next section will quantify, based on the ten Corps Community Centers studied, the direct costs of design time delays.

2.5 Design Delays Affect on Cost

As previously stated, the delay in design from concept drawings to construction documents do not, by themselves, adversely affect project cost. If the project consisted of simply providing documents, design delays would merely constitute a nuisance if the

production of documents was time sensitive. It is when construction inflation is factored in that design delays equate to lost dollars.

Given the amount of time in excess of the norm, 180 days as compared to 506 days, it is conceivable that as much as a year of construction time is lost. By taking the ten recently completed Corps Community Centers, and backing up the construction start date by one year and factoring in the construction inflation for that year, it is clearly evident that design time delays cost The Salvation Army significant capital dollars.

In Table 2.4, construction cost for each Corps Community Center studied is shown as actuals in the total construction cost column and then adjusted downward by the rate of inflation for the prior year.

Table 2.4 Construction Cost Adjusted For Inflation

Project Number	*Total Construction Costs*	*Project Completion*	*Project Completion Minus 1 Yr.*	*Inflation Rate Per Year*	*Cost Adjusted For Inflation*	*Dollar Cost Difference*
1	$3,166,570	19-Mar-01	19-Mar-00	3.47%	$3,056,690	$109,880
2	3,607,065	15-Mar-01	15-Mar-00	3.47%	3,481,900	125,165
3	2,576,104	03-May-00	03-May-99	2.81%	2,503,715	72,389
4	1,571,323	15-May-02	15-May-01	0.80%	1,558,752	12,571
5	2,270,381	16-Jun-03	16-Jun-02	2.00%	2,224,974	45,408
6	6,731,379	07-May-03	07-May-02	2.00%	6,596,752	134,628
7	2,096,563	15-May-03	15-May-02	2.00%	2,054,632	41,931
8	1,354,170	19-Dec-02	19-Dec-01	0.80%	1,343,337	10,833
9	2,121,929	13-Jul-00	13-Jul-99	2.81%	2,062,303	59,626
10	2,837,449	24-Feb-00	24-Feb-99	2.81%	2,757,717	79,732
Total	$28,332,933	N/A	N/A	N/A	$27,640,771	$692,163
Average	$2,833,293			2.30%	$2,764,077	$69,216

The construction cost index from which the annual inflation rates were derived, as provided by R.S. Means 2002 Construction Costs Indexes, is shown in Appendix B. The last column of Table 2.4 explicitly shows the cost differences as adjusted for inflation and quantifies the importance of minimizing design delays. In the ten Corps Community Centers studied, 2.3% of cost, a total of $692,163, could have been eliminated. This is an average of $69,216 per project that could have been saved, or reallocated to other programs, by improving the design processes to more closely resemble industry norms.

2.6 Advantages of a Standardized Design

In considering a standardized design as an improvement in the process, the product delivered, and reducing design time delays that ultimately translate into lost resources, David Cotts, a leading authority on facility management states, "Generally standardization and cost-effectiveness go hand in hand" (1999). School systems, "big box" retailers, fast food chains, and many other government and for-profit entities utilize standardized designs in order to maximize funding sources and efficiently produce their facilities.

In an article written by Janet Frankston entitled "Original Designs Not A Big Priority," she points out that schools save money with "cookie-cutter" style design. Frankston states, "When school districts construct so many schools in a year, design often isn't given much consideration because a "cookie-cutter" approach is the most economical" (2004). In the same article, spokesman for Gwinnett County, Georgia schools Sloan Roach states "Gwinnett County Schools built one high school, five middle schools and four elementary schools for this fall using standard design prototypes to save money" (Frankston 2004). Cherokee County, Georgia Schools Superintendent Frank

Petruzielo added "All classrooms in the district are designed the same way for a reason. We have spacious classrooms that makes it very easy for architects to design a building that will not break the bank" (Frankston 2004). It is rational to believe that the same positive outcomes, economic benefits and efficient product could exist with a prototypical design for Salvation Army Corps Community Centers.

Shelton Fowler, Architect with Blair Remy Corporation, P.C. and former staff architect for a large metropolitan school system, states that "Once the prototype design is developed, subsequent facilities can be constructed at a reduced rate for design fees. While there will always be site adaptation considerations and site specific civil engineering requirements, the basic design, floor-plan, dimensions, and elevations remain the same. Based on that assumption it is conceivable that design fees could be reduced as much as 2 to 3 percent" (2004). Table 2.5 reflects what savings could have occurred, under Fowler's assumption, in the ten Corps Community Centers studied.

Table 2.5 Design Fee Reduction

Project Number	***Design Fees***	***Original Design Fees As % of Construction***	***Less 2%***	***Original Fee Less 2%***	***Reduced Design Fees As % of Construction***	***Design Cost Difference***
1	$161,597	5.10%	2%	3.10%	$98,266	$63,331
2	185,109	5.13%	2%	3.13%	112,968	72,141
3	205,561	7.98%	2%	5.98%	154,039	51,522
4	86,999	5.54%	2%	3.54%	55,573	31,426
5	114,000	5.02%	2%	3.02%	68,592	45,408
6	601,921	8.94%	2%	6.94%	467,294	134,628
7	105,753	5.04%	2%	3.04%	63,822	41,931
8	81,987	6.05%	2%	4.05%	54,904	27,083
9	137,276	6.47%	2%	4.47%	94,837	42,439
10	219,089	7.72%	2%	5.72%	162,340	56,749
Total	***$1,899,293***	***N/A***	***N/A***	***N/A***	***$1,332,634***	***$566,659***
Averages	***$189,929.27***	***6.70%***		***4.70%***	***$133,263.40***	***$56,665.87***

When you combine the savings incurred when adjusting construction for inflation as shown in Table 2.4 with the savings in design fees as shown in Table 2.5, on the ten Corps Community Center projects studied, the amount becomes material and significant. Table 2.6 shows a total combined savings of $1,258,821, indicating an average of $125,882 or 4.05% per project.

Table 2.6 Combined Costs Savings

Project Number	*Construction Cost Savings*	*Design Cost Difference*	*Combined Design/ Construction $ Savings*	*Combined Design/ Construction % Savings*
1	*$109,880*	*$63,331*	*$173,211*	*5.20%*
2	*125,165*	*72,141*	*197,306*	*5.20%*
3	*72,389*	*51,522*	*123,911*	*4.45%*
4	*12,571*	*31,426*	*43,997*	*2.65%*
5	*45,408*	*45,408*	*90,815*	*3.81%*
6	*134,628*	*134,628*	*269,255*	*3.67%*
7	*41,931*	*41,931*	*83,863*	*3.81%*
8	*10,833*	*27,083*	*37,917*	*2.64%*
9	*59,626*	*42,439*	*102,065*	*4.52%*
10	*79,732*	*56,749*	*136,481*	*4.47%*
Total	*$692,163*	*$566,659*	*$1,258,821*	*4.16%*
Averages	*$69,216*	*$56,665.87*	*$125,882*	*4.05%*

The above data quantitatively suggest positive financial benefits can be derived from standardized design. By reducing design time to more closely resemble industry norms, on average, 326 days could be saved. Reducing design time by that number would negate or minimize the effects of inflation on the construction phase which translates into real dollar savings. And finally, design fees can be reduced as the design would only need to be adjusted to meet site, civil, and geographic requirements. While these

measures alone make a strong case for design standardization, there are qualitative concerns that can be realized as well.

Design time delays not only inflate the dollar costs of a project, they also affect the organization in the form of lost confidence and support from parties who have a vested interest in the success of the project. Having met with several Salvation Army representatives who were experiencing project delays, it is emphatically expressed that donors, contributors, Advisory Board and Corps Community Center members become frustrated when projects are delayed because the architect's design did not meet organizational standards. While the frustration level is hard to measure quantitatively, it becomes evident in the attitudes and actions of the design team, the Corps Community Center constituency, and corporate staff members who have the responsibility for constructing efficient, functional facilities. Further, in some extreme instances donors have withheld payment on capital campaign pledges pending evidence that the project is positively moving forward and not stalled because of design issues. Standardized design should, by minimizing design delays, remove, or at least reduce, frustration levels.

Another qualitative component is the elimination of surprises with the finished product. According to Major Larry White, Salvation Army Adult Rehabilitation Centers Commander, "Anyone who has been extensively involved in design and construction has experienced a project where what looked great on paper did not perform well in reality. Even with multiple reviews and revisions to the plans, things get missed or overlooked and the choice, if caught in time, is to revise the plans during construction, which results in costly change orders, or if funding is unavailable, we're forced to simply live with the mistake" (2004). While there may not exist a "perfect" building, by producing a model

based on a standard design, surprises should be eliminated, and with each project, perfection should become closer to reality.

Quicker occupancy of needed facilities is another by-product of a standard design. By removing or reducing the above mentioned obstacles, the project gets finished in a timely, cost effective manner. The fact is, in this organization, if the facility were not needed it would not be approved and funded. Standardizing the design hastens the process and puts the facility in use expeditiously.

2.7 Disadvantages of a Standardized Design

In discussing the concept of a standardized design with Salvation Army officers, two perceived disadvantages or objections are typically voiced. The first disadvantage stated is that capital project dollars are solicited from private entities in local geographic areas, thus, capital dollars should be spent locally. The second disadvantage is that standardizing the design disallows originality of the product.

Based on the fact that even with standard designs there will still be civil engineering and geographic concerns inherent with every project, the first objection in unwarranted. It would be prudent to include local engineers who are familiar with the geographic conditions and local politics on every project. The cost of attempting to design and build a facility without the benefit of "local" knowledge probably would offset any savings accrued. While the standard design may be produced outside local parameters, it is anticipated that engineering and local project management/supervision in the 4% to 5% range of construction cost would be the responsibility of local professionals. Further, in all but rare cases, the general contractor, as well as sub-contractors who would construct the facility, would be from the local geographic location.

In practice, the second objection which denies the local unit originality of design already exists to an extent. The current process requires that all phases of design be presented to corporate headquarters for approval. Those who review the submitted documents for approval routinely require plans to be modified to meet strict Salvation Army specifications with regard to dimensions, program controls, and interior and exterior finishes. In effect, a rough form of a standard design already exists. In addressing this argument, allowing local units to select from a range of interior and exterior finishes, furnishings, landscaping, signage, etcetera, could satisfy the need for originality of the design product. The standard design would be in the form of a floor-plan with all other elements, within certain limits, being selected by the local design team. This concept could be likened to purchasing an automobile. The dealership provides a base model car and the purchaser selects from a range of options to make the automobile fit the needs, wants, and appearance of the buyer.

Certainly there are many issues to consider in standardizing the process. Not every site will accommodate one design. Geographic concerns must be addressed with regard to mechanical systems, insulation, exterior finishes, and etcetera. However, the potential for efficiencies to be improved in terms of costs, delivery time, and program requirements of the facility are too great to ignore.

The primary goal of any business, whether in the traditional or non-profit environment, is to provide a quality product using the most efficient methods in order to create a positive reaction for stakeholders. Indeed "The Salvation Army is in the *"people"* business and our stakeholders are those who, in philanthropic spirit, contribute to our organization to assist in improving the world in which we live. From a program

standpoint, The Salvation Army funnels 83 cents of every dollar directly to services to people" (Watson 2001). This is an amazing accomplishment and, given the data provided in this chapter, it is possible that improvements in the design process can be implemented so that The Salvation Army is every bit as fiscally responsible in capital expenditures as well.

2.8 Recommendation

Based on the quantitative and qualitative results of the ten Corps Community Centers studied in this chapter, it is recommended that a standardized design be developed and implemented for Salvation Army use. While the development of a standard design does not of itself constitute a unique concept for the industry, it is unique to this organization. Further, it is recommended that an operation and maintenance plan, a capital renewal plan, and an emergency plan also be developed to coincide with the prototype. The development of these additional components do provide a degree of uniqueness in that it makes the design and construction function a fully "turn-key," integrated operation, particularly with regard to the capital planning aspect. With the development of an integrated maintenance and capital renewal plan that allows for the realization of full system/component life-cycles, those who manage the fiduciary responsibilities of The Salvation Army will have a state-of-the-art management tool that makes the science of capital planning through proper investment more accurate. That prospect is an exciting and innovative notion.

CHAPTER 3 - METHODOLOGY FOR DEVELOPING THE DESIGN

Based on the data derived from the study of the ten recently completed Corps Community Centers noted in the previous chapter, The Salvation Army's Southern Territorial Property Council, a subsidiary board of the Board of Trustees, approved the development of a prototype design. The study conducted of the ten Corps Community Centers quantitatively proved the financial losses incurred as a direct result of design processes currently practiced. Further, the end product of many of the Corps Community Centers proved inefficient in terms of program functionality, maintainability, and sustainability. In order to be effective, the expressed outcome of the prototypical design, once developed, would address each of these matters and correct the inefficiencies. The method by which the prototype would be developed was via committee.

3.1 Selecting the Prototype Design Committee

Because expertise with regard to Salvation Army program components and operations/maintenance and capital planning are competencies requiring different professional backgrounds and educational experiences, the committee had to include individuals with the proper credentials in order to successfully achieve the goal. For that reason, the committee membership included the following: a representative from Territorial Headquarters, who served as chairperson and scheduled, organized, and facilitated the meetings and research; Salvation Army Officers who currently serve at the Corps Community Center level; professional facility managers who had experience in the operations and maintenance of Salvation Army facilities; an individual with expertise in facility condition assessments and capital planning; and an architect who provided

technical expertise and architectural drawings through schematic phase. These individuals met together to discuss the critical issues and how all of these components (program, operations & maintenance, and capital planning) overlapped and affected each other. Those discussions, accompanied and supported by research, materialized in the form of architectural drawings to be revised and refined into the prototype design. The design included an operation & maintenance (O&M) and capital plan outlining preventive maintenance practices and the investment needed to operate at optimum standards for the life-cycle of the facility. It included an emergency plan as well. The area of expertise is matched with the prototype design components and shown in Figure 3.1.

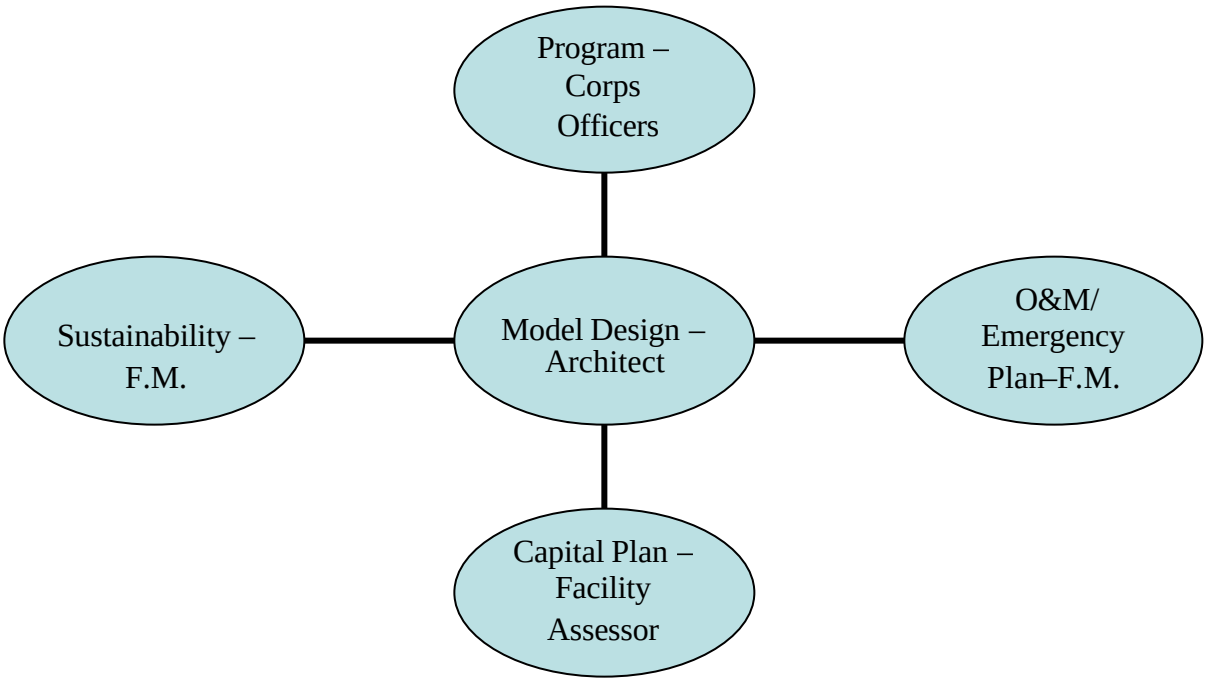


Figure 3.1 Design Components/Committee Responsibilities

The committee's actual membership included Robert Taylor, Assistant Territorial Property Secretary, who served as the committee chairperson. The committee included

four Salvation Army Officers, Major Chris Flanagan, Captain Tim Grider, Captain Tom McWilliams, and Captain Jacqueline Reckline, each having a minimum of ten years of Salvation Army service, a combined 56 years of service, at the Corps Community Center level. The Corps Officers served as the primary resource regarding program components, critical adjacencies, and other operational considerations affecting the design. Also included were two Salvation Army facility managers, Nathaniel Coles and Rob Walter, with a combined 32 years of experience, an architect, Brent Pope, who has performed consultative services for The Salvation Army for over twenty five years, and Carl Rabenaldt and Frank Orts whose expertise lies in facility condition assessments and capital planning.

3.2 Research Methods Used by the Design Committee

The research conducted in order to produce the most effective and efficient design included the following: site visits and tours of current Salvation Army facilities; a survey distributed to all Southern Territory Corps Officers; personal interviews with Salvation Army Officers and employees at the Corps Community Center level, capital planning consultants, information technology professionals, kitchen planners and designers; and finish materials and systems products tests.

It was determined that in order to perform the above noted research, five formal committee meetings would be scheduled. The meetings were held in Atlanta, Georgia and were one day in length with the exception of the site visits and tours which were held over a consecutive three day period in various cities. The first meeting took place on June 26, 2003. The final meeting took place on October 28, 2003 and included the formal presentation of the design prototype to the Board of Trustees. The prototype

design was developed over a period of 125 days or approximately 4 months. Committee members performed research individually and in smaller groups between scheduled meetings in order to accomplish the established goals and meet the time-line.

3.2.1 Site Visits and Tours of Current Salvation Army Facilities

In order to gather information as to what design features perform well for Salvation Army programs and functions, the Prototype Design Committee toured five current Salvation Army Corps Community Centers. In selecting the sites for touring it was important to the committee that the sites selected meet certain criteria. One such criteria for site selection included facilities of approximately the same size in terms of square footage and membership. Another criterion was that the facilities needed to be different in terms of design so that the Design Committee could make comparisons against each of the facilities visited. It was also important that the sites selected have a fairly wide range of programming components offered through the church or community center to the local community. Finally, the committee wanted to visit sites in different geographic areas of the Southern Territory. The site locations visited included Pasadena, Texas; Houston, Texas; Jacksonville, Florida; Daytona Beach, Florida and Atlanta, Georgia. It should also be mentioned that none of the Corps Officer representatives on the Design Committee were stationed in the above listed tour locations, which effectively provided four additional locations from which to draw experience and data.

Several days prior to arrival at a site location, a letter was sent to the local Corps Officer requesting that he/she meet with their staff to discuss various aspects of their facility. This letter included many of the same questions that were on the survey sent to all Salvation Army Corps Officers as shown in Appendix A. The Design Committee

requested that they provide answers to the survey questions and also asked them and their staff to answer three site specific questions. Those questions were as follows: 1.What design elements do you *like most* about your facility? 2. What design elements do you *like least* about your facility? 3. If you could change anything about your current facility what would it be? By reviewing the answers to the questions, the committee began to get a sense of common design elements that worked well and conversely those design elements that did not.

By comparing notes taken by the committee during the site visits and interviews with the occupants of those facilities, several issues began to surface as "common" design flaws. While most of those issues will be addressed later in section 3.2.2, some of the more prevalent concerns included: lack of storage space, lack of adequate space for future expansion, and two concerns that were not included in the survey, which were lack of visual control from a central station or stations, and the lack of attention to audio/visual needs in the design and construction phase. The latter of these two particular concerns was evidenced at practically every site visited by wires, speakers, projectors, and other miscellaneous equipment inappropriately and ineffectively displayed or hung obtrusively in conspicuous places throughout the facilities.

Another benefit to visiting the sites was having the opportunity to discuss many of the maintenance concerns with those individuals responsible for that function. While all the facilities visited were well kept and maintained, the effort to keep them that way was very labor intensive. For instance, the flooring in high traffic hallways in several locations were finished with vinyl composition tile (VCT) and were buffed and waxed to a high sheen. The personnel responsible for those floors commented on the amount of effort

required to maintain the polished look and how easily the floors became scared during regular, normal operations.

In every case noted above, the comments and concerns revealed and discussed translated into lost dollars and/or lost efficiency and effectiveness. The research conducted via site visits and interviews was documented in the form of notes to be incorporated into the prototype design.

3.2.2 Prototype Corps Community Center Survey

Research was conducted in the form of a survey to determine some of the deficiencies in the designs, operations and maintenance, and capital planning processes currently in place. As previously cited in Chapter 2, this survey was distributed to the total population of Corps Officers at the Corps Community Center level. That population totaled 322 Officers of which 50 responses were received for a response rate of 16%. While this rate may appear low in terms of drawing definitive conclusions, that rate, coupled with the site visits, interviews, and the experience level of those who review the design documents, provided ample support in making well-informed design decisions.

The survey consisted of 25 questions and was divided into three parts: 1. Planning, Design, and Construction; 2. Operations and Maintenance; and 3. Design/Construction Administration. The survey was written in an Excel Spreadsheet format and distributed to, and received from, the survey population via Lotus Notes. In an effort to control who completed the survey, surveys were sent directly to specific e-mail addresses of the Corps Officers and returned from the same e-mail address. The survey remained open for a period of four weeks. At the conclusion of the survey period, the surveys received were

imported into an Access Database program where the data was sorted and the results calculated.

In many instances, the results of the survey mirrored the data collected at the site visits. While the survey and the results can be reviewed in its entirety in Appendix A, other aspects concerning operations, maintenance, and capital planning will be addressed in subsequent chapters. Some of the most apparent design issues, as revealed by the survey, are highlighted below.

As mentioned in section 3.2.1, most Corps Community Centers lack sufficient storage space. The survey revealed that 74% of our Corps Community Centers do not have the storage space needed to function properly. The survey addressed other types of space as well, and the results indicated that 50% of the centers lacked adequate program space, 56% lacked adequate administrative space, 100% lacked room for future expansion, and 54% noted that their facility (parking, sidewalks, athletic fields) did not adequately support current program components. These deficiencies do not contribute to the success of Salvation Army mission and must be addressed and incorporated so as to produce more functional, flexible, and expandable space. The Design Committee reviewed the survey results, documented design problems, discussed possible alternatives, and incorporated solutions to design deficiencies in the prototype.

3.2.3 Personal Interviews

In addition to the interviews conducted in conjunction with site visits, personal interviews with relevant design and operations professionals were also conducted as part of the research process. These interviews included individuals who have specific expertise in areas such as kitchen planning and design, Leadership in Energy and

Environmental Design (LEED), mechanical systems engineering, facility condition assessments, operations and maintenance, and capital planning.

Each of the areas of professional discipline mentioned above were investigated and researched, primarily though personal interviews, in order to obtain "best practice" methods for Salvation Army facilities. The interviews conducted allowed the Design Committee to determine what impact certain types of equipment, systems, and finishes would have on the prototype design and what the cost/benefit ramifications would be if implemented. The results of those interviews, particularly with regards to specific recommendations to be incorporated into the prototype design, will be discussed in detail in subsequent chapters.

3.2.4 Finish Materials and Systems Products Tests

The Design Committee delegated the responsibility of researching finish materials (i.e. carpet, gym flooring, wall-systems, and lighting) to the facility managers on the design team. The overriding theme was to incorporate materials and finishes that are cost effective, most efficient, have the longest life-cycle, can be re-cycled, are aesthetically pleasing, and are easily maintained. It was also determined that, in all cases, form would follow function. This was to be accomplished primarily by observing what is used in similar facilities (churches, community centers, gymnasiums), and by having appropriate vendors demonstrate their products directly to the facility managers or via other media such as the internet, product brochures, or customer testimonials.

Because of the experience level of the facility managers on the Design Committee, this research task was easy to accomplish. Products that were specifically demonstrated and tested will be discussed in subsequent chapters.

3.3 Research Method Summary

By utilizing and conducting the research methods noted in this chapter, and by analyzing and incorporating the design changes as suggested by the data, The Salvation Army can produce a more efficient and effective Corps Community Center. Industry standards for the design of a project of this scope indicate a time of 180 days. The development of a prototype will expedite the current processes in order to align more closely with industry time standards. A review and tour of existing Salvation Army facilities, studying and learning from the experiences of Salvation Army Officers and employees, and the analysis of product testing will ensure that the design will be a conductor for fulfilling The Salvation Army's mission. The following chapter will preview the finished prototype facility and document how this research impacted the approved design.

CHAPTER 4 – THE PROTOTYPE DESIGN

Through the research methods outlined in Chapter Three, the Design Committee was able to take the broad concept of a prototype design and narrow the scope to focus on specific features that the model Corps Community Center should possess. The consensus of the committee was that the prototype should contain four basic components: an administrative wing; an educational and recreational wing; a multi-purpose area; and a chapel/auditorium (sanctuary). Because each location in the Territory is unique in terms of programs offered, capacity, and availability to fund the construction and/or operations, the design should be adaptable in terms of expanding or contracting to accommodate the distinctive needs of any location. In many cases, facilities are desperately needed, but funding is limited. With that in mind, the facility should be able to be built in phases and designed in such a way that, when capital funding is available, subsequent phases can be added to the building with minimal disruption of service and at the lowest cost. Finally, because operational funding is always a concern, the facility should be designed so that all areas can be visually controlled with minimal staffing. The remainder of this chapter will address, in detail, how all of the above issues are incorporated in the prototype design.

4.1 Expand or Contract To Meet Local Needs

Recognizing that no two Salvation Army locations will have exactly the same membership census, program components, and funding sources, it is foolish to think that a “one size fits all” design would be successful if implemented. In order to utilize a prototypical design, the size of the structure must be adaptable so that the specific needs

of a particular community are met without being over, or under, built. In order to achieve proper sizing, the most efficient design is a cross configuration where each of the four areas intersect at a common lobby. By doing so, each of the four wings could be separately sized, enlarged or decreased, based on facility needs. The prototype design, as shown in Appendix C, illustrates this concept by showing a facility designed for a mid-sized Corps Community Center. Mid-size is defined as a facility having approximately 25,000 square foot of built space, has all four basic components, and whose chapel would accommodate a congregation of 200. In the design, dotted lines are used to show how each of the wings could be expanded. The design can just as easily be modified to accommodate a smaller facility by shrinking any of the wings, as well.

4.2 Phased Construction

Designing the prototype so that it can be built in phases, rather than all at once, is another advantage of the cross configuration. In many cases, Salvation Army units identify funding sources that may allow them to construct limited needed facilities immediately, but lack sufficient capital dollars to accommodate long-range concerns. Utilizing the recommended prototype design allows for the construction of each wing as a stand-alone component that can be modified later to include additional wings. For example, it is feasible to build the administrative wing, education wing, and multi-purpose wing to accommodate basic Corps Community Center functions in the short-term, and upon receipt of additional funding, add the chapel/auditorium and gymnasium later to provide extended services.

By planning for future additions when purchasing property, it is easy to see that adding additional wings, or expanding existing wings, can be done cost effectively and

with minimal disruption of service. As shown in Table 2.6 in Chapter 2, if it is estimated to take several years to raise the total funding package, but funding is currently available for phasing the building, delaying construction until all funding is in place could result in inflated costs. Phasing is an option that should be considered if the above mentioned scenario exists.

4.3 Visual Control of the Facility

The Salvation Army operates programs and provides services in many of their Corps Community Centers where visual control of the facility must be present. With risk management and security concerns regarding the safety of occupants, the protection of equipment, and in order to properly receive members, clients, and guests, the design must allow for a common reception area that can visually control the facility and direct occupants to appropriate areas of the building.

In Salvation Army Corps Community Centers where all four areas of service exist, it is recommended that two separate entrances be provided. This is done so that the community center function could operate independently of the administrative and chapel/auditorium area and visa-versa. When the facility is fully functioning and both areas are in operation, best case scenario would be that the whole facility could be visually controlled by two staff members. One staff member would control the main entrance, lobby, administrative area, chapel/auditorium and multi-purpose room from the main reception area, while the other staff member would control the education wing, gymnasium, and also the multi-purpose area. By using glass in many of the wall systems surrounding these areas, visual control can be obtained, and occupants and potential members can easily see what activities are taking place in the facility. This is all

accomplished with minimal staff, which is in keeping with the ultimate theme of providing the best building and operation for the least cost. Line-of-sight visual control can be observed from the reception area just off the main lobby and the equipment/control office adjacent the gymnasium as shown in Appendix C.

4.4 Prototype Components of each Wing

The base model prototype Corps Community Center would contain an administrative area, a chapel, an education and recreation wing, and a multi-purpose area. While each location in the Territory may have different size requirements for each of these areas, there are some basic elements that each would have regardless of the size. In order to develop the floor plan, the Design Committee created Space/Room Data Sheets for each space in the facility. These data sheets would provide the architect with the function of each space as well as the necessary square footage requirements. The data forms also provided information with regard to architectural features, systems and utility requirements, critical adjacencies, and information with regard to fixed and loose equipment needs. The Space/Room Data Sheet can be reviewed in Appendix D.

The next section of this document will outline and highlight those areas. In order to avoid unnecessary repetition of where to view each of the elements that will be discussed, all examples can be found on the prototype plan shown in Appendix C. Room finishes and systems will be recommended and suggested, however, in most cases, what can actually be provided will be driven by available funding and prioritized by the local Corps Officer and constituency. The floor plan, however, is the critical element that should not be adjusted except to conform to site requirements.

4.4.1 The Administrative Area

The administrative area of the prototype consists of typical business office space and supporting areas such as a reception area, work-room/break-room, and file storage. The main reception area to the building resides in this area and is located adjacent to the main lobby. The reception area is designed so that the person occupying that space is visually aware of guests entering the building before they reach the main lobby. In this same area is a small waiting room for guests to sit until they are electronically allowed to enter the office area or until they are met in the waiting area by the Officer or employee they are there to visit. A single unisex restroom is located in the waiting area for the convenience of visitors waiting in this area.

The number of offices located in the administrative wing is dependent upon the staffing requirements of a given community. Typical office sizing would vary but generally range from 100 to 225 square feet. Social service casework and accounting offices are provided with unique features required to ensure safety and security. Additionally, some offices would require soundproofing or acoustical treatments for privacy. Practically all offices should be located on exterior walls with windows provided for natural light. Supporting areas should be located in the core area so that they are centrally placed for convenient use by administrative staff.

If social service casework is to be conducted in this facility, the caseworker's office is located adjacent to the waiting area so that clients have convenient access to that office. A food pantry for distributing packaged food borders this office and can be accessed either directly through the caseworker's office or through the waiting area. For safety purposes, the caseworker has two ways in or out of the office. Further, additional safety

is provided by installing view windows in this office. The windows are located so that the office can be viewed from the waiting area or from the office across the hallway from the caseworker's office.

The accounting office should be located away from the entrance of this wing for safety and security purposes. This office should also have a safe room or fireproof room for storage of cash, checks, permanent files, and legal documents.

A conference room should be included in this area for board meetings, staff meetings, or other small group functions. It is helpful if this room is located so that it can be entered or exited to and from the chapel. By locating this room in this way, it can be used as a pre-function area for weddings, funerals, plays, or other activities.

A centralized workroom for copying, faxing, and storing office supplies should be provided in the administrative area. This room could also include a small break area for administrative employees. A small room should be designated as an information technology server room (I.T. closet) to host the information technology equipment for this wing of the building or for the facility as a whole. Each office should have voice/data cabling provided on at least two walls with standard electrical outlets on each wall. Carpet is the preferred floor covering with the exception of restrooms and the workroom which should be stained concrete or ceramic tile. Wall systems will vary but should include nothing less substantial that standard sheetrock. Wall finishes should be semi-gloss paint or durable, washable wall covering. The ceiling height should be nine feet from floor to finished ceiling and the ceiling finish should be two feet by two feet acoustical tile with two feet by two feet light fixtures. Ceilings in all restrooms must be sheetrock. All office doors should be provided with light panels. The mechanical system

should be zoned so that the administration area can be controlled separately from the other wings.

Where funding is available, additional features should be added to this area. Those features would include small closets in each office, a unisex restroom for administrative staff, and additional offices and storage areas for future use.

4.4.2 Chapel/Auditorium

The chapel/auditorium should be the predominant feature of the building from the exterior. When observed from the exterior, the general public should immediate recognize this facility as a church. The chapel/auditorium should be located on the site so that it is the focal point from the area of highest visibility. As with each of the wings in the prototype, the size of the chapel/auditorium can be enlarged or reduced in order to accommodate the local congregational membership. The stage should be large enough to accommodate typical Salvation Army worship service participants, musical groups, and theatrical plays. The stage should be accessible from wings on either side and the stage front should be a radius from side to side with steps directly down to the chapel/auditorium floor. The stage floor finish is to be wood for acoustical purposes.

The chapel/auditorium should have a cry room for parents and infants located in the rear corner of the auditorium with one-way glass. This room must be sound proof and should have an audio speaker so that those in this room can hear as well as see the service or performance in the chapel/auditorium.

Audio/visual and lighting equipment conducive to enhancing worship services, musical performances and plays should be engineered for this area. An audio/visual and lighting room or area should be provided for controlling the equipment. Ideally this area

would be located in the back center of the chapel/auditorium and raised to stage level. The room or area must be able to be secured to protect the equipment when not in use. In connection with audio/visual and lighting concerns, acoustical engineering should be performed based on the interior dimensions, occupancy, and finishes. A ceiling or rear wall-mounted projector and an electronic drop down video screen should be provided for showing videos and making other media presentations. If natural light is entering this room, consideration for controlling that light via screens, tinting, or other means must be provided, as well.

The chapel/auditorium floor finish should be carpet, stained concrete, or any other high abuse, maintenance friendly products. The floor itself should be flat, not sloped, so as to provide for multi-use function in this area. The seating is to be non-fixed, moveable, gangable, stackable chairs. The lighting should be dimmable and sectioned for creating different effects. Some theatrical lighting should also be considered. The ceiling should be hard-surfaced for sound reflection. The main doors from the lobby into the chapel/auditorium should be provided with light panels. The mechanical system should be zoned so that the chapel/auditorium can be controlled separately from the other wings.

4.4.3 Multi-purpose Room and Kitchen

Where site conditions allow, the ideal location for the multi-purpose room is directly across from the chapel/auditorium. Both of these rooms are connected to a common lobby that allows for pre-function or post-function fellowship, receptions, exhibiting arts and crafts, or other appropriate functions. As noted by its name, the multi-purpose area provides flexible function space for a plethora of activities. This room is suited for

auditorium style seating, table seating for conferences or meals, open-planned for non-seated activities, or any combination of the above. This room should include a movable partition wall with acoustical properties so that the room can be sub-divided for smaller groups. The multi-purpose room is adjacent to a light-commercial kitchen for the production of meals and catering into the multi-purpose room or the gymnasium. As stated in regard to all of the wings, this space is sized to accommodate the serviceable needs of a particular Corps Community Center in a given geographic location. This component can also be built in phases dependent upon available funding. Current Salvation Army building specifications require a multi-purpose room accommodate two-thirds the capacity of the chapel/auditorium. This requirement should remain as a minimum.

Because of the variety of programs that could be conducted in this wing, audio/visual and lighting requirements should be addressed. A ceiling-mounted projector and electronic drop down screen should be provided and placed in the most practical location when the room is open for full capacity seating. This room should be acoustically engineered based on the finish material and occupancy. Because this room will frequently be reconfigured for multiple uses, storage for tables and chairs should be provided. The ceiling height in this room should be at least eleven feet from floor to finished ceiling. The ceiling should be solid with possible treys in order to accommodate mechanical system ductwork. The flooring in this room should be carpet, stained concrete, or other high traffic, maintenance friendly materials.

The kitchen, while adjacent, should be accessed through doors that conceal the serving line and kitchen area when not in use. The kitchen should also have a small

concession area that serves into the gymnasium. By designing the kitchen this way, equipment can be shared by both functions. It is preferable that the kitchen consists of concrete block walls and quarry tiled floors with dark colored grout. Kitchen equipment that produces excessive noise (i.e. ice machines and dish washers) should be placed as far away from the shared multi-purpose room wall as possible. If the gymnasium wall joins the multi-purpose room, it is recommended that a buffer be provided in the form of storage space in order to avoid sound/noise bleed from one area to the other. The mechanical system should be zoned so that the multi-purpose room and kitchen can be controlled separately from the other wings.

4.4.4 Education and Recreation Wing

The education and recreation wing, as with all other wings, can be built to match service needs. This wing, in a mid-sized operation, would include classrooms, an exercise/weight room, a games room, a dedicated computer training room/laboratory, a library, a gymnasium, and necessary support areas such as storage rooms and restrooms.

The number and size of the classrooms are location-dependent and should always include a nursery and/or toddler room(s) that should be located at the closest end to the chapel/auditorium. These rooms should include a shared toilet and the rooms should be divided by glass wall partitions so that one staff person could monitor both rooms. A television monitor should be located in each room so that activity taking place in either the chapel/auditorium or multi-purpose room could be viewed by the occupants. Other critical equipment would include a diaper changing table, a sink, a microwave oven, a refrigerator, and typical nursery furniture. If the site allows, these rooms should have direct access to an outdoor playground area.

Other classrooms should be sized to comfortably seat 15 adults at tables. All classrooms should have view windows into the room so that activity can be observed from the hallway or from the gymnasium office.

The exercise/weight room should be adjacent to the gymnasium with typical weight or aerobic equipment provided. This room should have view windows for visual control on three sides and one wall mirrored.

The gymnasium should be sized for regulation high school basketball competition. Side goals should be provided to allow for cross court play and all goals should be height adjustable. Bleachers should be the "tilt and roll" type so that they are portable and can be placed in activity appropriate locations. The gym floor should be striped for basketball, volleyball, and any other sport as decided by the local Salvation Army representatives.

There are several finishes that are preferred, and in most cases, will be mandated for use. Those finishes include a synthetic floor consisting of a recycled rubber base topped with polyurethane. This flooring system allows for multi-use functions and is an extremely low maintenance product. Acoustical decking is used in conjunction with an exposed ceiling and flexible, fabric H.V.A.C. duct. The decking allows the gym to be used for functions requiring noise control and the flexible duct insures that balls, or other flying objects, will not damage the ductwork.

The games room provides recreation space for community center activities. This room is basically open floor plan that can be used for table games, arts and crafts, video gaming, or other activities as determined by the local community.

The games room, gymnasium, exercise/weight room, and computer training room should be situated so that they can be entered and controlled separately or in conjunction with other areas of the building. As previously stated, by using view windows in these locations, they can all be visually controlled with minimal staffing. The mechanical system for the education and recreation areas should be zoned so that they operate independently. The gymnasium should be on its own H.V.A.C. system.

The restroom facilities in this area should mirror each other with an entrance to restroom facilities from the classroom area hallway and from the gymnasium. This is the most economical configuration for plumbing components. Because of the rough nature of activities that take place in this part of the facility, if concrete block is used on interior wall spaces, "bull-nose" blocking should be provided at all corners. The gymnasium side restrooms should contain an area for changing clothes and provide lockers. A small vending area should be provided in the games room nearest the gym entrance.

4.5 LEED Certification – Systems and Finishes

The U.S. Green Building Council, the nation's foremost coalition of leaders from across the building industry, developed a ratings system for assessing building performance and meeting sustainability goals. According to the U.S. Green Building Council, "the rating system, known as LEED (Leadership in Energy and Environmental Design), was created to:

- Define "green building" by establishing a common standard of measurement
- Promote integrated, whole-building design practices
- Recognize environmental leadership in the building industry
- Stimulate green competition
- Raise consumer awareness of green building benefits
- Transform the building market

Based on well founded scientific standards, LEED emphasizes state-of-the-art strategies for sustainable site development, water savings, energy efficiency, materials selection and indoor air quality" (2003). LEED is a point-based rating system with points being earned for building attributes considered environmentally beneficial. Designers can pick and choose the credits (points) that are most appropriate to their project to achieve a LEED rating. LEED has four performance levels:

25 to 32 points: Certified	33 to 38 points: Silver
39 to 51 points: Gold	52 to 69 points: Platinum

The Salvation Army, like most corporations, is certainly interested in designing and constructing facilities that possess the qualities associated with LEED certification, particularly with regard to energy efficiencies. However, because the building industry and materials manufacturers have not yet wholly transitioned to using sustainable materials and practices, construction costs, at present, increase incrementally with the various levels of LEED certification.

In order to determine whether or not The Salvation Army should mandate that newly constructed Corps Community Centers obtain LEED certification, a simple cost/benefit analysis was researched by the Design Committee. The analysis, provided by Enermodel Engineering, a leading LEED consulting firm, is shown in Table 4.1. A review of the results indicates that construction costs for LEED certification increases incrementally dependent upon the level of certification obtained above conventional construction. The increases range from 2% for basic certification to 10% for the highest level, Platinum certification. The energy savings realized with LEED design and construction is significant and also ranges incrementally from $0.75 per square foot to $1.50 per square foot. Table 4.1 indicates that the typical payback period for the increase in construction

cost is from under 3 years to over 10 years, again depending upon the level of certification achieved. Given these facts, the Design Committee recommended that LEED certification be considered for all newly constructed Corps Community Centers where funding is available to meet the increase in construction cost. While it is not practical to believe that Platinum, or even Gold, certification is obtainable, it is certainly appropriate and practical to standardize on basic certification or certification at the Silver level. With cost usually being the predominating factor, Kathy Roper, CFM, CFMJ, MCR, LEED AP points out that "while the average cost increases mentioned previously are appropriate, by bringing LEED experienced team members in on the project early and providing a clear understanding of the goal, some projects are experiencing no increases at all" (2005).

Table 4.1 LEED Cost Benefit Analysis

LEED Points	Certified 26 to 32	Silver 33 to 38	Gold 39 to 51	Platinum 52 to 69
Typical Energy Savings	30% to 40%	40% to 50%	50% to 60%	60% and over
Incremental Construction Cost	2%	5%	7.5%	10%
Annual Utility Savings	$0.75/Sq Ft	$1.00/Sq Ft	$1.25/Sq Ft	$1.50/Sq Ft
Typical Payback Period	Under 3 years	3 to 5 years	5 to 10 years	10+ year

Using the data provided in Table 4.1, we can then predict what the construction cost may have been in the ten recently constructed Corps Community Centers studied, had they been LEED certified to the Silver level. While the construction cost may have increased, with utility savings in the 40% to 50% range, and the payback period for the increase in construction cost being 3 to 5 years, the benefits would far surpass these increases over the life-cycle of the facility. Those facts, coupled with the reality that

capital funding is far easier to raise than operating income, suggest that it would be fiscally irresponsible not to build for the efficiencies gained by LEED design and construction. Table 4.2 illustrates the increase in construction cost that would have occurred in the ten Corps Community Centers studied if LEED certification had been obtained at the Silver certification level.

Table 4.2 Construction Cost Comparison – LEED to Conventional

Project Number	***Total Construction Costs***	***LEED (Silver) Cost Increase***	***Total LEED Construction Costs***	***Variance***
1	$3,166,570	5.00%	$3,324,899	$158,328
2	3,607,065	5.00%	3,787,418	180,353
3	2,576,104	5.00%	2,704,909	128,805
4	1,571,323	5.00%	1,649,889	78,566
5	2,270,381	5.00%	2,383,900	113,519
6	6,731,379	5.00%	7,067,948	336,569
7	2,096,563	5.00%	2,201,391	104,828
8	1,354,170	5.00%	1,421,879	67,708
9	2,121,929	5.00%	2,228,025	106,096
10	2,837,449	5.00%	2,979,321	141,872
Total	***$28,332,933***	***5.00%***	***$29,749,580***	***$1,416,647***
Averages	***$2,833,293***	***5.00%***	***$2,974,958***	***$141,665***

In Chapter 2, Table 2.6 Combined Costs Savings displayed the combined design and construction costs savings that could have been realized using a standardized design enabling construction to start a year earlier. Using an average design fee of 4% of construction cost, Table 4.3 Design/Construction Savings Compared to Added LEED Cost indicates that 40% of the projects could have afforded the increase in LEED certification costs simply by applying the savings in design time delay related increases. Further, on average, all projects could have afforded LEED certification up to the Silver level had they realized the savings available through efficient design processes.

Table 4.3 Design/Construction Savings Compared to Added LEED Cost

Project Number	*Increase Due To LEED*	*Combined Design/ Construction $ Savings*	*Variance*
1	$158,328	$144,814	($13,514)
2	180,353	165,992	(14,362)
3	128,805	174,905	**46,100**
4	78,566	36,717	(41,849)
5	113,519	68,592	(44,927)
6	336,569	467,294	**130,725**
7	104,828	63,822	(41,006)
8	67,708	38,654	(29,055)
9	106,096	112,025	**5,929**
10	141,872	185,323	**43,451**
Total	***$1,416,647***	***$1,458,138***	***N/A***
Averages	***$141,665***	***$145,814***	***$4,149***

While not all projects will be able to achieve LEED certification, the Design Committee recommended systems and finishes that are sustainable and produce operating efficiencies. The zoning of the HVAC systems conserve energy by only heating and air-conditioning parts of the facility in use. The inclusion of natural light conserves energy by not having to artificially light spaces used in daylight hours. The Design Committee specified the use of infrared restroom fixtures to conserve water consumption. Finish materials such as carpet, gymnasium floor, and furniture will be made from re-cycled materials and can be re-cycled at the end of their life. All of these examples will be implemented in the prototype design and will be mandated for use even when LEED certification is not possible.

The Salvation Army recognizes the responsibility it has with regard to the environment as it relates to construction of new facilities. Bruce M. Haxton, AIA and Douglas Keys, RIBA, AIA reminds us that “Construction materials significantly impact

the environment, from the forest where timber products are harvested to the landfills where construction materials are disposed and each step has some environmental impact. For example, construction and demolition waste amount to approximately 40% of the total solid waste volume in the United States" (2004). By striving to acquire LEED certification, The Salvation Army will do their part to ensure that natural resources and our environment are protected and conserved. The Salvation Army is a major participant in the construction business, and as such, we want to be on the forefront of innovation and conservation. Constructing for maintainability and sustainability not only ensures efficiency, thereby positively affecting the cost of operating, it is simply the right thing to do in terms of being a good corporate citizen.

CHAPTER 5 – OPERATIONS, MAINTENANCE & CAPITAL PLAN

Several years age a very well known automotive oil company ran a successful advertising campaign whose slogan was "pay me now or pay me later." The premise of the add was that in order for your automobile to run smoothly for the predicted life of the vehicle, frequent preventive maintenance measures, in this case oil changes, needed to be performed. The same premise that applied to the automobiles in the advertisement holds true for facilities, except that the slogan should read "pay me now or pay me *many times more* later."

As noted in Chapter 2, Section 2.8, the development and benefits of a prototype design is not a unique concept in the design and construction industry. It is however, a fairly unique application in the design of churches and community centers. What makes this prototype design distinctive is the integration of an operations, maintenance, capital renewal and emergency plan that is custom tailored specifically to the design, and can be modified easily when changes to the design are needed.

The internal survey conducted and referenced earlier in this document revealed that 94% of respondents did not have a documented capital renewal plan, 92% did not have a documented operations and maintenance plan, and 78% did not currently have a schedule and log of preventive maintenance for their Corps Community Center. It is clear, based on those findings, that the development of these management tools is critical.

What follows in this chapter is a discussion of the need for, and the development of, an operations, maintenance and capital renewal plan. The emergency plan will be addressed in Chapter 6.

5.1 Why Develop an Operations and Maintenance Plan?

For most facility managers, architects, contractors, and engineers, preventive maintenance is a concept that is readily understood and wontedly practiced. For facility users and owners, preventive maintenance is viewed as a function that is nice to have in times of economic boom, but a cost center that is easily reduced or cut when resources are scarce. The development of an operations and maintenance plan that is priced and planned during the design phase allows the owner the opportunity to view and budget for operational costs prior to construction and/or occupancy. In some cases, the reality of seeing the costs of ownership in terms of operations and maintenance costs may influence the decision of whether or not to construct at all.

Building Owners and Managers Association International (BOMA) addresses the issue of preventive maintenance in a 1996 publications titled *Overview of Maintenance Programs.* It states that "A well maintained property will operate more efficiently, last longer and command a higher value than a property without the benefit of a comprehensive preventive maintenance program."

Preventive maintenance programs also preserve equipment warranties. In the same BOMA article, the writer states that "A common belief is that a maintenance contract is not needed in the first year because it is under warranty. A warranty will not change filters, grease bearings or check the safeties and controls. In fact, if equipment fails, the manufacturer's first defense to avoid warranty obligations is to request the preventive maintenance record. If there is no record of preventive maintenance, regardless of whether preventive maintenance would or would not have prevented the failure, it will be more difficult to have the manufacturer honor the warranty" (1996).

BOMA documents that "Preventive maintenance, when performed regularly, preserves the initial investment. Also, preventive maintenance is significantly less costly and disruptive than replacing or repairing of major systems when they break down. A comprehensive preventive maintenance plan allows the building's systems to operate at peak efficiency for the useful life of the equipment. Considering the number of operating hours for a piece of equipment over its entire useful life, the cost of poorly operating equipment is tremendous. The benefits in operating savings significantly outperform the cost of preventive maintenance" (1996). The information in Table 5.1 provides an example of the cost associated with poorly performed preventive maintenance. The example from BOMA uses a 300,000 square foot building that expends approximately $70,000 per year to operate a chiller. The loss is based on a 20% decrease in equipment operating efficiency due to poor maintenance resulting in additional cost of $14,000 per year.

Table 5.1 BOMA PM Cost Loss Analysis

300,000 sq ft/400 sq ft/Ton	**=**	**750 Tons Peak**
750 Tons @0.65 KW/Ton	=	487.5 Peak KW
487.5 Peak KW @ 1800 Equivalent Full Load Hour/Year	=	877,500 KWH/YR
877,500 KWH/YR @ $0.08/KWH	=	$70,200/YR
20% of $70,200/YR	=	$14,040/YR

Table 5.1 clearly indicates the cost associated with the lack of performing preventive maintenance. By not performing simple preventive maintenance on the chiller unit,

inefficiencies are created in the system resulting in additional expenditures of $14,040 annually to the building owner.

5.2 When to Develop the Operations and Maintenance Plan

Because everything that is designed into the facility impacts operational cost, the optimum time to develop the operations and maintenance plan is in the design phase of the project. By including the design team in the discussion of operations and maintenance, building system components and finishes can be considered that have lengthy life-cycles and are maintenance friendly. At the International Facility Managers Association Conference (IFMA) held in 1987, Larry Gleason, in his presentation titled *Modeling Facility Construction Alternatives*, graphically illustrated the relationship between time and cost when considering what types of equipment and systems to incorporate into a facility. Figure 5.1 below is a representation of that relationship.

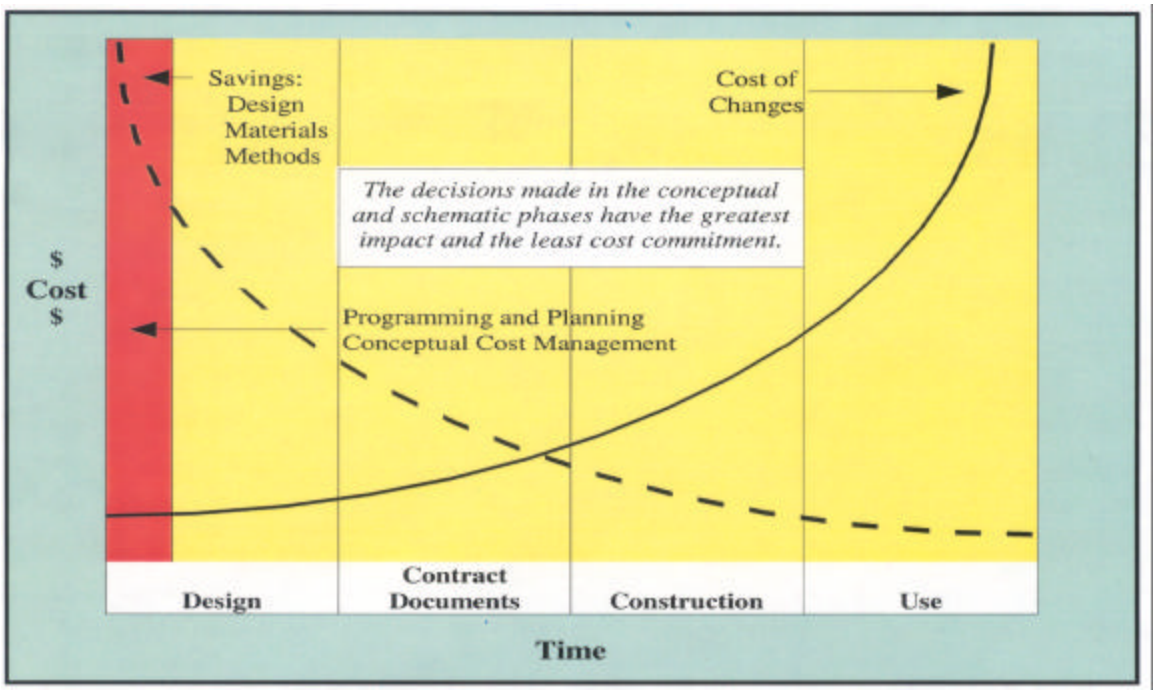


Figure 5.1 Time and Cost Influences

Figure 5.1 graphically displays the relationship time has on cost depending on when building components and systems are considered. When components, materials and methods are planned for and included in design documents, cost is relatively low. When construction, or occupancy, of the facility begins, if changes in materials or methods are determined to be necessary, the costs of making and implementing those changes increase significantly during the construction and use phase. By integrating the operations and maintenance plan into the standardized design concept, it ensures that costs-effective measures are incorporated into the design documents. It also allows for the inclusion of long life-cycle, low maintenance components and effectively provides the owner/occupant a comprehensive program for performing the necessary preventive maintenance.

5.2 The Capital Plan Component

Historically, The Salvation Army has experienced that when soliciting funding for new facilities, capital monies are far easier to acquire than operational dollars. The primary reason for this is that people who contribute to these endeavors enjoy being able to point to tangible edifices and know that they played a role in its construction. It is far less satisfying it seems, to take credit for the carpet being vacuumed on a daily basis. That being the case, it is imperative that the organization understands at the design stage what the operational and capital replacement costs for a facility are going to be prior to construction. When those costs are identified, the capital investment needed to endow the facility for operations and capital renewal can be forecasted. Once the investment amount is determined, capital campaign goals can be identified and set to meet the construction budget, and to financially sustain the facility for its entire life-cycle.

Understanding that standardized design, operations, maintenance, and capital planning by themselves are not a new concept, the manifestation of such a plan as this, integrated and incorporated at the design stage, makes this standards program unique.

5.4 The Purpose and Use of the Operations, Maintenance, and Capital Plan

The purpose of developing an operations and maintenance plan is to estimate the total costs for facility maintenance and capital renewal over a 50 year life of the facility. From these estimates, we can predict the monetary amounts required in a sinking fund investment account to fund those needs.

The plan is divided into the following sections: Preventive Maintenance Plan, Interior Cleaning Plan, Exterior Maintenance Plan, Capital Renewal Schedules and Staffing Recommendations.

5.4.1 The Preventive Maintenance Plan

The Preventive Maintenance Plan lists the equipment scheduled for installation in the facility. From this list, an annual preventive maintenance schedule, based on R.S. Means and General Services Administration (GSA) guidelines, is generated for daily, weekly, monthly, quarterly, semi-annually, and annual maintenance standards. Standard man-hours, labor rates, and material costs are then used to predict costs to perform those preventive maintenance tasks. Reproducible forms for each type of equipment are included to provide a checklist of required procedures as well as a permanent record of the work performed.

5.4.2 The Interior Cleaning Plan

The Interior Cleaning Plan is a detailed plan for daily, every other day, bi-weekly, monthly, and quarterly cleaning tasks based on labor rates, man-hours and R.S. Means equipment costs. Combining the R.S. Means guidelines with actual facility quantities allows the generation of an estimated annual budget for cleaning the facility.

5.4.3 The Exterior Maintenance Plan

The Exterior Maintenance Plan is a detailed plan for daily, weekly, monthly, semi-annual, and annual maintenance tasks based on labor rates, man-hours and R.S. Means equipment costs. Combining the R.S. Means guidelines with actual facility quantities allows the generation of an estimated annual budget for performing routine maintenance on landscaping and hardscaping.

5.4.4 The Capital Renewal Plan

The Capital Renewal Plan is developed to project future capital renewal costs for building and site systems. The renewal costs are based on the estimated replacement costs for the various building components and estimated service life of those individual systems. The data for estimating the replacement costs comes from the facility plans and specifications. Costs are estimated using R.S. Means costs data. The initial basis for service lives comes from the Building Owners and Managers Association International (BOMA). The Capital Renewal Plan also provides an alternate plan based on adjusted service lives expected due to a well defined and executed preventive maintenance plan.

5.4.5 Staffing Recommendations

Staffing recommendations are based on the previously mentioned Preventive Maintenance Plan, Interior Cleaning Plan, and Exterior Cleaning Plan.

5.5 When to Generate the Operations, Maintenance, and Capital Plan

The generation of the Operation, Maintenance, and Capital Plan will happen at the completion of the Design Development Documents phase at the earliest and at the completion of the Construction Documents phase of design at the latest. The appropriate documents and specifications will be electronically forwarded to an outside vendor who assisted in the development of the Operations, Maintenance, and Capital Plan. Information from the documents will be entered into the newly-created Building Operations Plan software and the plan will be produced. Training and implementation of the plan is discussed in Chapter 7.

5.6 Benefits of the Operations, Maintenance, and Capital Plan

The benefits of the operations, maintenance, and capital plan include reduced overall costs through the performance of preventive maintenance, elimination of premature failure of building systems, minimizing operational disruption, and allowing the owner to predict, plan for, and fund capital renewal functions.

The Preventive Maintenance Plan ensures reliable equipment operations, alerts the owner to premature failure, minimizes operational disruptions, and can extend the life of building systems at a minimal cost. The extension of service lives of building systems through proper preventive maintenance can yield significant savings over the life of the facility.

The Interior Cleaning Plan and Exterior Maintenance Plan can assist the owner in budgeting annual operational costs as well as provide a detailed list of duties to be performed by the maintenance staff. Should out-sourcing be desired, the plans provide a scope of work for bidding and performance purposes.

The Capital Renewal Plan helps the owner plan for major capital expenditures prior to system failure in order to ensure uninterrupted operations and may reduce costs by scheduling work during times of economic downturn.

Annual facility assessments will allow the plan to be updated on a regular basis. This will alert the owner of potential savings that could be realized through additional maintenance extending the life of certain systems, or bringing to light potential premature failure of systems. Immediate corrective measures can then be implemented to avoid disruptions to the facility operations.

5.7 Operations, Maintenance, and Capital Plan Outputs

The Operations, Maintenance, and Capital Plan will produce several documents that will assist The Salvation Army in successfully operating, maintaining, and planning for capital renewal functions. The following section describes those outputs and provides samples in Appendix F for the documents detailed in section 5.7.1, 5.7.2, 5.7.3, 5.7.6, 5.7.9. All of the sample documents are based on the model Corps Community Center being constructed in Columbus, Georgia. The Columbus model is discussed further in Chapter 7, Section 7.1.

5.7.1 Building Operations Plan Summary

The Building Operations Plan summary provides the owner with basic information regarding a specific building project. The first part of the summary includes facility information such as the facility name, the location, the type of building, the owner, the site area (acres), the building area square footage, and the number of floors to be constructed.

The second part of the Building Operations Plan Summary provides study parameters that include the replacement cost of the facility, the base year of occupancy, and four variables that can be adjusted depending upon economic conditions and building life. Those variables include the anticipated rate of inflation, the anticipated life of the facility in years, the discount rate, and the soft cost percentage.

The next section of the Building Operations Plan Summary provides the owner with sinking fund requirements needed to operate the facility over the intended life of the building. This section provides line item dollar amounts for capital renewal, preventive maintenance, interior cleaning, exterior maintenance, and utilities. The sinking fund requirements are based on BOMA life-cycle costing and a column is also provided for BOMA adjusted life-cycle costing. Because the intended use of Salvation Army facilities is not as intensive as BOMA Class A requirements, The Salvation Army adjusted some of the life-cycle costing of certain facility components. For instance, BOMA life-cycle on carpet replacement is seven years while The Salvation Army estimates carpet life at ten years. Each line item described above includes a percentage of replacement. This report can be reviewed in Appendix F and indicates, using the Columbus, Georgia model, that sinking fund requirements to maintain at the BOMA life-cycle level would be

$4,847,925, and using The Salvation Army adjusted life-cycle the sinking fund requirement would be $4,035,456. The final portion of the summary includes a location map of the building site.

5.7.2 20 Year Budget Summary

The second report included in the Operations, Maintenance, and Capital Plan is a 20 Year Budget Summary. This report provides the owner with an overview of the first 20 years of facility operation and details the capital renewal cost, preventive maintenance cost, and operational cost. Those three items are then totaled for an annual cost for all three functions. The total is then divided by the building square footage to provide a square foot cost for the three functions noted above.

The bottom portion of this report provides the same information as above except in graphical form. This graph provides the owner with an easy to read chart of capital renewal costs, preventive maintenance costs, and operational costs and easily illustrates the years in which spikes in costs will occur. This report is provided in BOMA life-cycle cost form and adjusted life-cycle cost form for comparison. This report is shown in Appendix F.

5.7.3 Major Equipment Listing

The next four reports are provided under the Preventive Maintenance Section of the Operations, Maintenance, and Capital Plan. The first of these is the Major Equipment Listing. The Major Equipment Listing provides the owner with the actual equipment installed in the facility. This information comes directly from the specifications provided by the architect for each individual project.

The Major Equipment Listing provides five columns of information that includes the item (i.e. roof top HVAC, heat pump, water heaters), the identifying mark on the construction documents, the area of the building where the equipment is located, the manufacturer of the equipment, and the model number. A sample of this report can be reviewed in Appendix F.

5.7.4 Preventive Maintenance Forecast

The Preventive Maintenance Forecast is a detailed report listing all pieces of equipment requiring preventive maintenance. The first six columns of this report include the specific piece of equipment, the quantity of each piece of equipment in the facility, the annual cost of performing preventive maintenance on each specific piece of equipment, the number of years of estimated facility life, future value of all preventive maintenance, and the net present value of the piece of equipment. The following columns provide the annual cost of performing preventive maintenance on each piece of equipment for the life of the facility. In Salvation Army Corps Community Centers, the anticipated life of the facility is 50 years. Based on that life-cycle, this report would contain 50 columns of annual preventive maintenance cost for each piece of equipment listed, as well as the six columns discussed earlier. Due to the length of this report (56 columns), it is not possible to include a sample in this document.

The importance of this report is that it provides the owner with a detailed listing of all the equipment requiring preventive maintenance and the annual cost associated with that performance. Each column is totaled providing the owner with an annual budget for performing preventive maintenance.

5.7.5 Preventive Maintenance Matrix

The Preventive Maintenance Matrix is a schedule of when preventive maintenance is to be performed for each piece of equipment listed in the Preventive Maintenance Forecast. The Preventive Maintenance Matrix indicates whether the tasks are to be performed weekly, monthly, quarterly, semi-annually, or annually. It also indicates whether the tasks will be performed by in-house labor or outsourced vendors. The costs per hour and material costs are provided using R.S. Means and General Services Administration guidelines. From that data, period cost and annual cost for preventive maintenance are forecasted.

This document also provides the quantity of each piece of equipment listed, the name of the equipment, and a code that corresponds with a preventive maintenance work form that will be discussed in Section 5.7.6. Again, due to the length of this report, it is not possible to provide a sample in this document.

5.7.6 Preventive Maintenance Work Forms

Preventive Maintenance Work Forms are provided in the Operations, Maintenance, and Capital Plan so that the employees responsible for preventive maintenance can easily see what required maintenance is needed for each piece of equipment, know when the maintenance should be performed, and document that the required preventive maintenance was done. If the local unit decides that certain preventive maintenance functions should be outsourced, this document provides the vendor with a scope of work required for a particular piece of equipment. And because labor and materials costs are provided in the Preventive Maintenance Matrix, the owner can determine if he/she is getting a reasonable price from the outsourced vendor.

Using these forms takes the guesswork out of preventive maintenance with regard to functions to be performed and when the maintenance should be done. A sample of the Preventive Maintenance Work Form can be reviewed in Appendix F.

5.7.7 Interior Cleaning Plan

The Interior Cleaning Plan provides the owner with a detailed report listing all interior areas that have to be cleaned, a description of the work to be performed, the man hours needed to perform the tasks, the frequency in which the work has to be done, and material cost for the cleaning. Frequency in this report is provided in daily, every other day, weekly, bi-weekly, monthly, and quarterly increments. From the information noted above, incremental costs are provided then totaled on an annual basis. Finally, the annualized cost is broken down to a cost-per-square-foot for interior cleaning. Due to the length of this report, it is not possible to provide a sample in this document.

5.7.8 Exterior Maintenance Plan

The Exterior Maintenance Plan provides the owner with a detailed report listing all exterior areas that have to be maintained, a description of the work to be performed, the man hours needed to perform the tasks, the frequency in which the work has to be done, and material cost for exterior maintenance. Frequency in this report is provided in weekly increments only. From the information noted above, incremental costs are provided then totaled on an annual basis. Finally, the annualized cost is then broken down to a cost-per-square-foot for exterior maintenance. Due to the length of this report, it is not possible to provide a sample in this document.

5.7.9 50 Year Capital Renewal Comparison

The 50 Year Capital Renewal Comparison is a graph comparing the BOMA capital renewal dollar amounts needed to maintain the facility in optimum shape as compared to The Salvation Army adjusted capital renewal dollars. The value of this report lies in the fact that the owner can pictorially see the years in which spikes in capital replacement dollars will occur. By analyzing and understanding why and when these spikes will happen, the local Salvation Army unit can financially plan for major capital expenditures well in advance of the actual disbursement period. A sample of this report, based on the Columbus, Georgia model, can be reviewed in Appendix F.

5.7.10 Facility Renewal Forecast

The Facility Renewal Forecast report provides the owner with a detailed listing of all systems and finishes installed in the facility, the life expectancy of the system or finish, the replacement value, how many times the system or finish will have to be replaced during the life of the facility, and the value attached to that replacement. The replacement values for all individual components are then totaled to provide an annual dollar amount for replacement for each year of operation.

This report is provided in two formats. The first format provides detail in ten, twenty, twenty five, thirty, thirty five, and forty year increments. The second format provides detail for each year for the total life of the facility. The report is also provided in BOMA life-cycle costing format and Salvation Army adjusted life-cycle costing format. Each of these formats coincides with the 50 Year Capital Renewal Forecast previously described in Section 5.7.9. Because of the length of these reports it is not possible to provide a sample in this document.

5.7.11 Annual Assessment Worksheet

The first part of the Annual Assessment Worksheet lists the systems and finishes installed in the facility, describes the system or finish, states the life expectancy of the system or finish, details the replacement cost of each, and dates when the next predicted renewal will take place for each component.

The second part of the Annual Assessment Worksheet is to be completed upon the execution of an actual facility condition assessment. Once the assessment is conducted, information will be provided in this report that gives the owner an opportunity to see if the systems and finishes are being maintained properly, what percentage of each component is used, make adjustments to renewal cost forecast, and prioritize capital renewal of the systems and finishes. As with many of these reports, due to the length, it is not possible to provide a sample in this document.

5.7.12 Other Documentation

The Operations, Maintenance, and Capital Plan will also include other information beneficial to the owner. The appendix of the document will include definitions, references, technical support, and a reduced set of record documents for the facility. It is anticipated that the final version of this inclusive plan will be in a three volume set. The first volume would contain all the information discussed in Section 5.7. The second volume would include information on how to perform basic maintenance and cleaning tasks so that those responsible for those functions can easily reference relevant "best practice" methods. And finally, the third volume would include the actual owner's manuals provided by the manufacturers of the installed systems and finishes.

5.8 Operations, Maintenance, and Capital Plan Summary

The plan described above is perhaps the most exciting and innovative portion of the standardized design process. While it is relatively simple to budget and plan for design and construction elements, planning and forecasting for operations, maintenance, and capital renewal has not been such an exact science. By providing this plan to the local Salvation Army units in advance of construction, decisions can be made concerning the financial viability of the project, not just for building the structure, but for operating the facility for the entire life-cycle of the building.

The software for the operations, maintenance, and capital renewal plan was developed through a collaborative effort with The Salvation Army Southern Territory and 3D International. The individuals credited with its development include Robert Taylor representing The Salvation Army, and Carl Rabenaldt and Frank Orts representing 3D International.

CHAPTER 6 – EMERGENCY PLAN

As with all business entities, The Salvation Army has a responsibility to provide a safe environment for its members, clients, and business partners. And while no organization can prevent emergencies or disasters, whether natural or man-made, it is incumbent upon building owners to prepare for emergencies before they occur. In order for the prototype design concept to be considered a complete package, an emergency plan must be developed and provided to local Salvation Army Corps Community Centers so that when emergency circumstances arise, occupants are aware of how to avoid or minimize injury and loss.

6.1 Why Develop An Emergency Plan?

According to Commissioner Philip Needham, Salvation Army Territorial Commander, "An emergency can occur at any time or place. Salvation Army facilities are just as vulnerable to an emergency or disaster as any other building in our communities. Some of these threats are natural, such as tornadoes, floods, or winter storms, while others are man-made, such as power failure, bomb threats, or workplace violence. The Southern Territory Emergency Plan has been developed to help prepare for these emergencies. The development of this plan will minimize or eliminate potential hazards in the building, and also discusses how to respond to various incidents that occur" (2004).

While it is hoped that an emergency plan is never needed, developing such a plan provides a step-by-step approach to disaster preparedness by walking staff members and occupants through disaster scenarios. The plan is developed to inform those who use the

facilities how to identify potential hazards, how to prevent disasters from happening, appropriate actions to take in an emergency, and with whom to communicate when an emergency exist. By being informed, risk are avoided or minimized.

According to the Federal Emergency Management Agency (FEMA), "The plan should be developed using the most reliable hazard awareness and emergency education information including advances in scientific knowledge, the most accurate technical language, and the latest physical research on what happens in disasters" (2005). By developing a plan using the above cited information, and making the plan regionally specific in terms of most likely natural disasters, lives, equipment, and facilities can be saved and losses minimized.

6.2 Why Prepare?

In terms of managing emergency situations in public and private facilities, being prepared is everyone's responsibility. Building owners and staff members are responsible for protecting themselves and their occupants against hazards. In a document presented by FEMA titled *Are You Ready*? (2005), the authors describe two primary benefits to being prepared to deal with emergencies:

- Being prepared can reduce fear, anxiety, and losses that accompany disasters. Communities, families, and individuals should know what to do in the event of a disaster.
- By being prepared, people can reduce the impact of disasters and sometimes avoid the danger completely.

Jeff Jelletts, Southern Territorial Disaster Coordinator, stated, "In times of disaster, people who are uninformed or unprepared try to invent new procedures during an emergency or act on rumors heard from others. Some of the information may be wrong

and will only confuse the situation or further endanger those affected by the situation. By developing a disaster plan and preparing through practice drills and exercises, when disaster strikes, those who are prepared can act appropriately to minimize or eliminate injury, damage, or loss" (2004).

6.3 Creating the Disaster Plan Template

In order to prepare for disaster situations, an emergency plan template was developed for use by The Salvation Army, Southern Territory. A sub-committee of the Design Committee was formed to research and discuss how the template should be developed, what should be included in the plan, and how the plan would be incorporated into the prototype design. The sub-committee included facility management staff, maintenance engineers, risk management personnel, human resources personnel, and was lead by the Territorial Disaster Coordinator.

The emergency plan was created in template form so that appropriate parts of the document could easily be revised, through a fill-in-the-blank method, to customize the plan for each individual location. The variable information that would need to be input into the document would be basic facility information, applicable local telephone numbers for responders, safety team appointments, evacuation plan, building emergency systems, and locations of equipment that needed to be accessed during emergency situations. A copy of the plan would be distributed to every employee in the facility so that they can read and familiarize themselves with the threats and emergencies and know how to respond in the appropriate manner. A copy of the plan could also be distributed to local fire, police, and emergency agencies so that they are familiar with Salvation Army emergency plans and procedures.

The plan includes a list of fourteen specific emergencies or threats and describes each type of incident, what to do and who to call:

Bomb Threat	Elevator Emergency	Theft
Computer Virus	Power Failure	Tornadoes
Fire	Severe Weather	Earthquakes
Hazardous Materials	Suspicious Mail	Workplace Violence
Medical Emergencies	Suspicious Object	

Because the plan needs to be location and building system specific, an appendix will be added to each plan identifying the location and type of mechanical, electrical, and plumbing system. A picture of each component will be taken and inserted into the plan with identifying arrows pointing to valves, breakers, and other components that need to be controlled, adjusted, or shut-off in certain emergency situations.

The emergency plan will be provided to the local Salvation Army Corps Community Center in both hard copy and electronic version so that updates and changes can be made to the plan when necessary. The emergency plan template will be completed and delivered to the local Corps Community Center officer prior to occupancy of a newly constructed facility. While this plan was developed for the prototype design process for new construction, it can just as easily be produced and implemented for existing Salvation Army facilities across the Territory. Further discussion regarding the implementation of the emergency plan will be provided in Chapter 7.

CHAPTER 7 – IMPLEMENTATION OF THE PLAN

The preceding chapters of this document make a very strong case for, and outline the advantages of, a standardized design, operations and maintenance, capital and emergency plan for Salvation Army Corps Community Centers. And while the benefits could be quantified and realized, without a detailed implementation plan, the standardized components alone will not produce the end result of functional, maintainable, sustainable facilities. Specific implementation tools that will be used to successfully design, build and operate effective Corps Community Centers include:

?? Construction of a model Corps Community Center
?? Production of a video tour of the model facility
?? Revision of the *Construction Project Manual*
?? Development of a training program for the Operations, Maintenance, & Capital Plan
?? Development of a training program for the Emergency Plan

This chapter will detail how these tools will improve the process and ultimately provide efficient and effective buildings.

7.1 Building A Model Corps Community Center

Based on the recommendations of the Design Committee, The Salvation Army Southern Territory authorized construction of a model Corps Community Center. The model was to be built according to the prototype design as shown in Appendix C, with modifications made to the design to adapt to site conditions and to accommodate size requirements of the local unit selected. The building site selected was located in Columbus, Georgia.

The Salvation Army in Columbus, Georgia had conducted a capital campaign for the purpose of constructing a Corps Community Center. A local architectural firm was hired

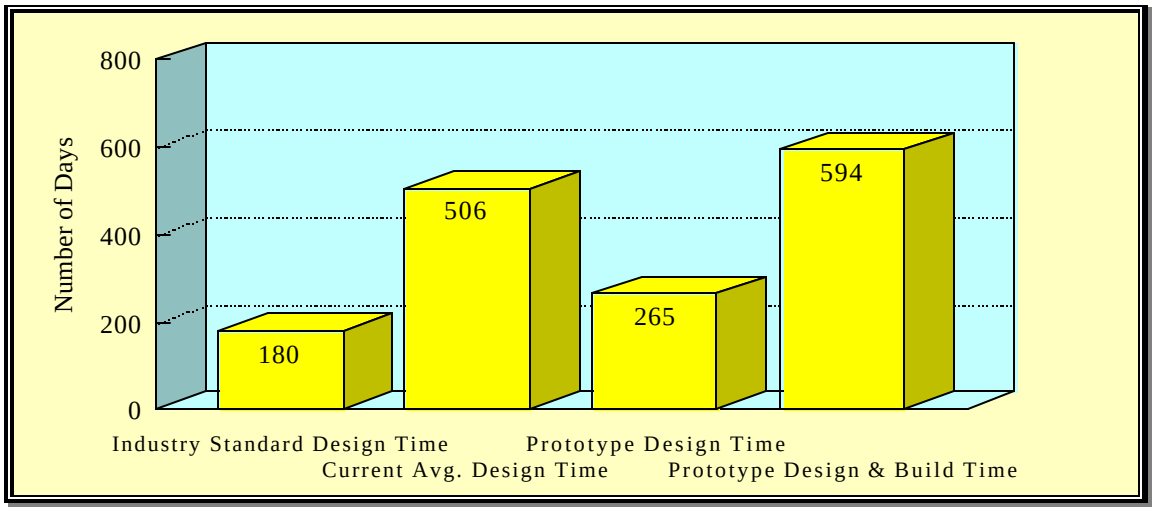
to design the facility and The Salvation Army's internal design and construction processes were started. A pre-schematic meeting was conducted with the architectural firm, and for a period of four years, the design process flowed up and down the administrative chain as shown in Chapter 2, Figure 2.1. Because the design being produced by the Columbus firm had not yet been approved by The Salvation Army for construction due to design deficiencies, and because Columbus was in close proximity to the Army's Corporate Headquarters in Atlanta, Columbus was chosen as the site for building the model Corps Community Center.

Building a model for the Territory will provide several opportunities that not only help in the implementation process, but allow results to be measured and adjustments to be made where needed to make the standardization process even more efficient and effective for subsequent projects. One area in question was the design time needed to produce a prototype facility. As stated in Chapter 3, the design Committee met for the first time on June 26, 2003 and presented the prototype design for approval on October 28, 2003. The process for designing the prototype from inception to Schematic Phase documents took 125 days. On March 16, 2004 the Construction Documents for the model Corps Community Center were approved. The total process for designing the prototype from inception (June 26, 2003) to developing Construction Documents (March 16, 2004) took 265 days. This is approximately half the time it took for the ten Corps Community Centers studied, where the average design time was 506 days. Based on this information, it is easily conceivable, in fact predictable, that designing a Corps Community Center should take no longer than the industry average of 180 days. Further,

given the fact that several months were used developing the prototype, the design time should be even less.

It should be mentioned that construction on the model began on June 8, 2004 and is scheduled to be substantially complete on May 3, 2005. Total design and construction will be completed in 594 days or only 88 days (approximately 3 months) longer than design services alone in the ten Corps Communities Centers studied. Table 7.1 illustrates the differences in design times as noted above.

Table 7.1 Design/Construction Time Chart



The chart above clearly illustrates the savings in design time which ultimately results in more expedient construction starts and completions.

The prototype design had to be adjusted in order to adapt to the site already purchased in Columbus. This element presented an excellent opportunity to illustrate how flexible the prototype design was in terms of being able to easily conform to site conditions. The Columbus model is shown in Appendix E. A comparison of the prototype shown in Appendix C with the Columbus model in Appendix E reveals that the multi-purpose

room, education wing and the gymnasium were relocated. All other components remain virtually unchanged.

Having designed and completed the model, we can now provide local communities who are considering these facilities a documented timeline for design and construction, record documents and specifications to review, a model that illustrates how the prototype can be site adapted, a turn-key budget, an operations, maintenance, capital renewal, and emergency plan, and a completed, functioning model to tour. All of these items will be used as implementation tools toward the standardized, prototypical design method of constructing Corps Community Centers.

7.2 Production of a Video Tour

Another implementation tool used to propagate efficiency and effectiveness is the production of a video tour of the model Corps Community Center. Because photographs and video of actual components, finishes and systems are far more effective than written words in terms of making a designer aware of the concept, a digital video disk (DVD) will be included in the design package delivered to an architectural firm hired by The Salvation Army to design a Corps Community Center. The DVD will be part of the *Construction Project Manual* currently used by The Salvation Army.

Video of the constructed model will also be made available via the internet to local Corps Community Center administrators who may be considering the construction of a new facility. This will also be a valuable tool for presentation to potential donors in cases where a capital campaign is being conducted in order to fund a project. This tool will eliminate much of the guesswork in selecting finishes and systems and will provide local

Corps Community Center members with visual illustrations of preferred products to be used in construction.

7.3 Revision of the *Construction Project Manual*

The Salvation Army Southern Territory developed and currently uses an internally produced *Territorial Construction Project Manual* that informs local Salvation Army Officers, Advisory Board members, architects, and contractors of the design and construction processes and procedures mandated by The Salvation Army. This manual also provides budget instructions, required specifications for different types of facilities, preferred and/or required finishes and systems, preferred vendors and suppliers, insurance requirements, delivery systems, and end of project procedures.

The manual will be revised to more specifically describe the standardized design concept and requirements relative to the design and construction of Corps Community Centers. The current manual is only available to recipients in hard copy format. The revised manual will be available in hard copy and electronic format with direct internet links to preferred products, vendors and suppliers. Further, as mentioned in Section 7.2, a video tour of the constructed model will be included in the package.

7.4 Training Program for Operations, Maintenance, and Capital Planning

The operations, maintenance, and capital plan (OM&CP) will be developed in template form so that each plan can easily be adapted and customized to local facilities. The operations, maintenance, and capital plan development was discussed in detail in Chapter 5 and will be a mandatory part of the project completion process.

The initial OM&CP data will be compiled and input into a database through documentation provided directly from the architect and the local Salvation Army Officer. The documentation will include construction documents and specifications, hours of operation, and program staff recommendations. Once the data has been loaded into the software, a *Building Operations Plan* manual will be produced and distributed to the local Salvation Army unit. The contents of the Building Operations Plan manual were described in Chapter 5.

Prior to the opening of a new Corps Community Center, formal training will be provided on site for the Corps Officer, maintenance engineers, outsource vendors, and other concerned parties. The training will include a thorough review of the *Building Operations Plan* manual, instruction on the operation of specific building systems and finishes, how to conduct recommended preventive maintenance, how to document maintenance performed on the systems, and how to use the capital renewal program. The recommended training outline is as follows:

- Overview of the *Building Operations Plan* Manual
- Preventive Maintenance Plan
  - What is Preventive Maintenance?
  - Equipment Identification and Locations
  - Using the Preventive Maintenance Schedule
  - Completing the Preventive Maintenance Forms
  - Maintenance Records
- Interior Cleaning Plan
  - Using the Cleaning Plan
  - Carpet/Floor Care
- Outside Maintenance Plan
  - Understanding Outside Maintenance
  - Using the Outside Maintenance Plan
- Capital Renewal
  - What is Capital Renewal?
  - Using the Capital Renewal Schedules
  - How Good Maintenance Can Enhance Service Life

?? Annual Assessments
    - The Purpose of Annual Assessments
    - Using the Building System Matrix

The initial training will be very comprehensive in nature and will be conducted prior to, or immediately after occupancy of the facility. Additional training will be provided in conjunction with the 11-month warranty inspection at which time a facility condition assessment will be performed and an inspection report produced. From the point of the 11-month warranty inspection and assessment, follow-up training, facility condition assessments, and inspection reports will be provided on a bi-annual basis.

By compiling facility information through bi-annual assessments, internal data will be available to benchmark against industry standards with regard to operations and maintenance functions and costs. Using that data, The Salvation Army can then ascertain where adjustments need to be made to more effectively integrate operations and maintenance features into future designs.

7.5 Training Program for Emergency Planning

The emergency plan will be developed in template form so that each plan can easily be adapted and customized to local facilities, conditions, and response needs. The emergency plan development was discussed in Chapter 6 and will be a mandatory part of the project completion process.

It is recommended that the local officers, staff members, volunteers, and emergency responders (i.e. fire, police departments, and rescue squads) be part of the planning and development process of completing the template. By doing so, local emergency procedures and information will be discussed and transferred into the template. Once the

template is complete, a Divisional Headquarters and/or Territorial Headquarters Disaster Coordinator will review the completed template and conduct on-site training and drills.

7.6 Implementation Summary

The implementation tools discussed above provide the local community, the designers, and the contractors products they can use to effectively design, build, and operate an effective and efficient Corps Community Center. As with most corporate entities, the officers in the field cling to their autonomy and only tend to seek advice from higher authorities when all other choices have been exhausted. In the survey conducted and shown in Appendix A, when questioned if Divisional Headquarters (DHQ) and Territorial Headquarters (THQ) provided positive assistance in the planning, design, and construction phases of their project, respondents replied negatively 50% and 66% respectfully. Further, 56% of respondents stated that, generally speaking, they would desire less involvement from both DHQ and THQ. Lastly, 100% of respondents indicated that they would not recommend that all projects be directly managed by THQ and that they are not satisfied with the current design and construction processes of The Salvation Army.

Upon review of the survey data noted above, it is apparent that field officers are not satisfied with the current processes, desire even less involvement from both levels of headquarters than is currently provided, and are seeking improvement in the current methods. However, the survey also indicates that 74% of field officers consider a prototype Corps Community Center design template beneficial in project planning and capital budgeting. The goal therefore, is to provide the assistance at the corporate level in "stealth" form so as to be as un-intrusive as possible, yet make sure that the end product

achieves the corporate goal. The development and use of the implementation tools discussed in this chapter provide a conduit for achieving that objective.

CHAPTER 8 – CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER STUDIES

The Salvation Army is one of the best organizations in the world when it comes to effectively executing programs for both crisis and preventive intervention. The mission of the Army draws its strength form what takes place on a daily basis in Corps Community Centers around the world. In his book, *Building for Effective Mission*, Dr. Kennon Callahan advises, "Build on your strengths and add new ones to serve your mission. Do better what you do best" (1995). By implementing a standards program that integrates design, operations, maintenance, capital renewal, and emergency planning, The Salvation Army does exactly what Dr. Callahan suggests…they build on their strengths. Further, a new dimension is added by building facilities that programmatically support their mission, are maintainable and sustainable, and provide data at the design stage that allows them to plan financially to properly endow the facility for operations and capital renewal.

8.1 Conclusions

The data discussed and analyzed in Chapter 2 clearly documents the inefficiencies and financial loss incurred as a result of the current design processes of The Salvation Army. The Army's inability to produce design documents in a timely manner result in additional cost commensurate with the construction inflation rate in the range of 2% to 3% per project. Further, design delays diminish credibility with donors and significantly extends the timeline for occupancy of needed facilities.

Creation of a standardized design can effectively reduce design delays by providing architects with a standard floor plan that is programmatically functional, can be visually controlled with minimal staffing, can utilize phased construction and incorporates systems and finishes that are sustainable and maintainable.

The internal survey conducted provides evidence of the lack of experience at the field level to manage construction projects which also negatively affects the process. The survey further reflects the lack of documented operations, maintenance, and capital renewal planning and implementation which contributes negatively towards effective operations. By providing a standardized design that incorporates and integrated operations, maintenance, and capital plan that is easy to customize to meet local conditions, The Salvation Army can more effectively and efficiently produce and operate facilities that are conducive to fulfilling the Army's mission.

In an article written by David Wyatt entitled *The Promise and Pitfalls of Prototype Facility Design*, three elements are identified that make standard design attractive. Those elements are: reducing design schedules and costs for repeat projects; maximizing construction efficiency; and improving occupancy/use function (2003). By implementing the program discussed in this thesis and by studying the results provided by constructing the model and adjusting where necessary, The Salvation Army can, and should, realize those same benefits.

8.2 Further Studies

Because the design and construction business is in a continual state of improvement with regard to systems, finishes, and delivery methods, the prototype design and recommended products will also require frequent updates and modifications. The design

processes, and the integrated components, will be a fluid, living progression of change based on the experiences of those who occupy, operate, and maintain the model Corps Community Centers being constructed throughout the Southern Territory.

As part of the process, it is recommended that an annual review be conducted with the Corps Officers and staff members of newly constructed Corps Community Centers to discuss with them the design features that are positively and negatively affecting the operations of the facility. This could be done in much the same method as used in the site tours discussed in Chapter 3, Section 3.2.1.

By conducting the site visits and interviews noted above, changes to the prototype design can be made and implemented so as not to repeat design elements that are not producing the desired result. Conversely, those elements that are working in a positive manner can be preserved and continued in subsequent designs. Figure 8.1 below illustrates how the review process is a continuum of improvement.

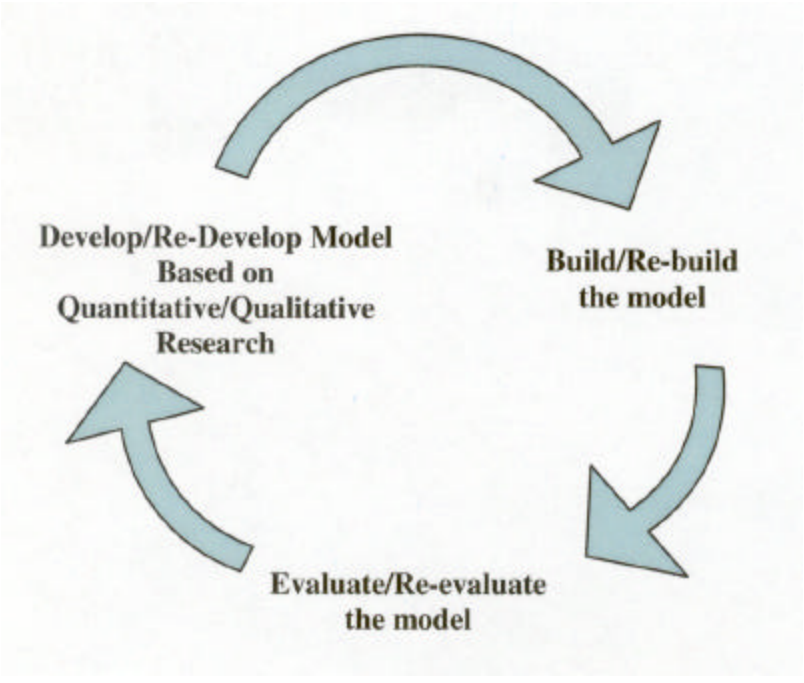


Figure 8.1 Design Process Continuum

The operational cost savings anticipated through LEED certified design are too great to ignore. Energy savings in the 30% to 40% range and annual utility savings of $0.75 per square foot realized at the basic certification level would far exceed the incremental increase of 2% of construction cost over the life of the facility. Further studies should be conducted with regard to LEED Certified facilities to document initial costs and then track savings to The Salvation Army over a period of three to five years. Once the initial payback period on any increase in LEED construction versus conventional construction has been realized, those savings could then be projected over the remaining life of the building to determine the total savings to The Salvation Army for the full life of the facility.

While this document concentrated on improving the current processes, it is recommended that a study be conducted to determine the cost savings implications with regard to utilizing an 'in-house' staff of architects to perform design functions for all Salvation Army facilities. This study should also explore the concept of utilizing architects on retainer or contracted through Indefinite Delivery Indefinite Quantity (IDIQ) contracts to perform design services at a negotiated rate or perhaps a rate incorporating a sliding scale basis of payment for work performed.

Finally, a study should be conducted to determine and prove whether or not the operations, maintenance, and capital plan calculations are realistic, specifically in terms of capital investment needed for operations and replacement costs. The adjusted life-cycle cost figures should be re-evaluated based on years of experience to see if they are adequate or inadequate, or if they need to more closely relate to the BOMA predictions.

Designing and constructing buildings is not the mission of The Salvation Army. Facilities are a tool for delivering hope and service to those to who are ministered. Effectively and efficiently designing and operating facilities to accommodate and enhance The Salvation Army's mission is critical to the success of the organization. By incorporating the integrated standard design processes studied and discussed in this thesis, it is believed that the process will be improved and result in significant financial savings that can be diverted to life-changing programs.

APPENDIX A

PROTOTYPE DESIGN SURVEY AND RESULTS

Salvation Army Corps Community Center
Prototype Design Survey Questions and Results

Total Population = 322 Total Responses = 50 Response Rate =16%

Planning, Design, and Construction	**0**	**1-2**	**3-4**	**>5**
1. How many Salvation Army construction projects have you been involved in as a Salvation Army Officer?	52%	48%	0%	0%
	Yes	**No**		
2. Have you been directly involved in the construction of a new Corps Community Center?	40%	60%		
3. Does the design of your Corps Community Center provide adequate storage space?	26%	74%		
4. Does the design of your Corps Community Center provide adequate program space?	50%	50%		
5. Does the design of your Corps Community Center provide adequate administrative space?	44%	56%		
6. Does the design of your Corps Community Center provide adequate room for expansion?	0%	100%		
7. Does the exterior area of your facility (parking, sidewalks, athletic fields, etc.) provide adequate support for program components of your Corps Community Center?	46%	54%		
8. Would you consider a prototype (model) Corps Community Center design template beneficial in project planning?	74%	26%		
9. Would you consider a prototype (model) Corps Community Center design template beneficial in capital project budgeting?	76%	24%		
10. Did Divisional Headquarters provide positive assistance in the planning, design, and construction phases of your project?	50%	50%		
11. Did Territorial Headquarters provide positive assistance in the planning, design, and construction phases of your project?	34%	66%		
12. If you were planning a new Corps Community Center, would you consider using a non-local architect with Salvation Army experience over a local architect if costs were equal or lower?	50%	50%		
13. If you were planning a new Corps Community Center, would you consider using a non-local contractor with Salvation Army experience over a local contractor if costs were equal or lower?	42%	58%		

Operations and Maintenance	**Yes**	**No**		
14. Do you currently have a documented capital replacement plan for the systems in your Corps Community Center?	6%	94%		
15. Do you currently have a documented operations and maintenance plan for your Corps Community Center?	8%	92%		
16. Do you currently have a schedule and documented log of preventive maintenance for your Corps Community Center?	22%	78%		
17. Would you consider a computerized template for operations, maintenance and capital planning beneficial in your Corps Community Center?	48%	52%		
18. Would you consider standardization of finishes (paint, carpet, flooring, etc.) beneficial in the construction and ongoing operations of your Corps Community Center?	24%	76%		
19. Would you consider standardization of systems (HVAC, lighting, plumbing, etc.) beneficial in the construction and ongoing operations of your Corps Community Center?	56%	44%		
20. Would you consider using a THQ recommended "one source" provider for all your preventive maintenance and repair needs with the understanding that the provider utilizes current local vendors if desired by the local command?	62%	38%		
Design/Construction Administration	**More**	**Less**		
21. Generally speaking, would you desire more or less THQ/DHQ involvement in the design and construction of your project?	44%	56%		
	Yes	**No**		
22. Do you have local Salvation Army paid staff members that are professionally trained to manage a Corps Community Center design and construction project on behalf of the owner?	4%	96%		
23. To expedite the design and construction process, I recommend all construction projects be more directly managed by THQ.	0%	100%		
24. I am satisfied with the current design and construction processes of The Salvation Army and would not recommend change.	0%	100%		
	DP	**CP**	**OM**	
25. In my opinion, the area where most guidance from THQ/DHQ is needed is in the Design Phase, Construction Phase, Operations and Maintenance Phase.	52%	30%	18%	

APPENDIX B

CONSTRUCTION COST INDEXES

Construction Cost Indexes

Cost in Year B: $ 1,000,000

$$\frac{\text{Cost Index Year A}}{\text{Cost Index Year B}} \times \text{Cost in Year B} = \text{Cost in Year A}$$

Cost Index Table

** If the cost in Year B is $ 1,000,000 , it would cost 'X' to build in Year A*

		YEAR "B"												
	Year >	2002	2001	2000	1999	1998	1997	1996	1995	1994	1993	1992	1991	1990
	Year / Cost Index	126.1	125.1	120.9	117.6	115.1	112.8	110.2	107.6	104.4	101.7	99.4	96.8	94.3
YEAR "A"	2002 126.1	$ 1,000,000	$ 1,007,994	$ 1,043,011	$ 1,072,279	$ 1,095,569	$ 1,117,908	$ 1,144,283	$ 1,171,933	$ 1,207,854	$ 1,239,921	$ 1,268,612	$ 1,302,686	$ 1,337,222
	2001 125.1	$ 992,070	$ 1,000,000	$ 1,034,739	$ 1,063,776	$ 1,086,881	$ 1,109,043	$ 1,135,209	$ 1,162,639	$ 1,198,276	$ 1,230,088	$ 1,258,551	$ 1,292,355	$ 1,326,617
	2000 120.9	$ 958,763	$ 966,427	$ 1,000,000	$ 1,028,061	$ 1,050,391	$ 1,071,809	$ 1,097,096	$ 1,123,606	$ 1,158,046	$ 1,188,791	$ 1,216,298	$ 1,248,967	$ 1,282,078
	1999 117.6	$ 932,593	$ 940,048	$ 972,705	$ 1,000,000	$ 1,021,720	$ 1,042,553	$ 1,067,151	$ 1,092,937	$ 1,126,437	$ 1,156,342	$ 1,183,099	$ 1,214,876	$ 1,247,084
	1998 115.1	$ 912,768	$ 920,064	$ 952,026	$ 978,741	$ 1,000,000	$ 1,020,390	$ 1,044,465	$ 1,069,703	$ 1,102,490	$ 1,131,760	$ 1,157,948	$ 1,189,050	$ 1,220,573
	1997 112.8	$ 894,528	$ 901,679	$ 933,002	$ 959,184	$ 980,017	$ 1,000,000	$ 1,023,593	$ 1,048,327	$ 1,080,460	$ 1,109,145	$ 1,134,809	$ 1,165,289	$ 1,196,182
	1996 110.2	$ 873,910	$ 880,895	$ 911,497	$ 937,075	$ 957,428	$ 976,950	$ 1,000,000	$ 1,024,164	$ 1,055,556	$ 1,083,579	$ 1,108,652	$ 1,138,430	$ 1,168,611
	1995 107.6	$ 853,291	$ 860,112	$ 889,992	$ 914,966	$ 934,839	$ 953,901	$ 976,407	$ 1,000,000	$ 1,030,651	$ 1,058,014	$ 1,082,495	$ 1,111,570	$ 1,141,039
	1994 104.4	$ 827,914	$ 834,532	$ 863,524	$ 887,755	$ 907,037	$ 925,532	$ 947,368	$ 970,260	$ 1,000,000	$ 1,026,549	$ 1,050,302	$ 1,078,512	$ 1,107,105
	1993 101.7	$ 806,503	$ 812,950	$ 841,191	$ 864,796	$ 883,579	$ 901,596	$ 922,868	$ 945,167	$ 974,138	$ 1,000,000	$ 1,023,139	$ 1,050,620	$ 1,078,473
	1992 99.4	$ 788,263	$ 794,564	$ 822,167	$ 845,238	$ 863,597	$ 881,206	$ 901,996	$ 923,792	$ 952,107	$ 977,384	$ 1,000,000	$ 1,026,860	$ 1,054,083
	1991 96.8	$ 767,645	$ 773,781	$ 800,662	$ 823,129	$ 841,008	$ 858,156	$ 878,403	$ 899,628	$ 927,203	$ 951,819	$ 973,843	$ 1,000,000	$ 1,026,511
	1990 94.3	$ 747,819	$ 753,797	$ 779,983	$ 801,871	$ 819,288	$ 835,993	$ 855,717	$ 876,394	$ 903,257	$ 927,237	$ 948,692	$ 974,174	$ 1,000,000

Table of Inflation Rates

** The cost of building in Year "B" would be X% (more/less) than in year Year "A"*

		YEAR "B"												
	Year >	2002	2001	2000	1999	1998	1997	1996	1995	1994	1993	1992	1991	1990
	Year / Cost Index	126.1	125.1	120.9	117.6	115.1	112.8	110.2	107.6	104.4	101.7	99.4	96.8	94.3
YEAR "A"	2002 126.1	0.00%	-0.79%	-4.12%	-6.74%	-8.72%	-10.55%	-12.61%	-14.67%	-17.21%	-19.35%	-21.17%	-23.24%	-25.22%
	2001 125.1	0.80%	0.00%	-3.36%	-6.00%	-7.99%	-9.83%	-11.91%	-13.99%	-16.55%	-18.71%	-20.54%	-22.62%	-24.62%
	2000 120.9	4.30%	3.47%	0.00%	-2.73%	-4.80%	-6.70%	-8.85%	-11.00%	-13.65%	-15.88%	-17.78%	-19.93%	-22.00%
	1999 117.6	7.23%	6.38%	2.81%	0.00%	-2.13%	-4.08%	-6.29%	-8.50%	-11.22%	-13.52%	-15.48%	-17.69%	-19.81%
	1998 115.1	9.56%	8.69%	5.04%	2.17%	0.00%	-2.00%	-4.26%	-6.52%	-9.30%	-11.64%	-13.64%	-15.90%	-18.07%
	1997 112.8	11.79%	10.90%	7.18%	4.26%	2.04%	0.00%	-2.30%	-4.61%	-7.45%	-9.84%	-11.88%	-14.18%	-16.40%
	1996 110.2	14.43%	13.52%	9.71%	6.72%	4.45%	2.36%	0.00%	-2.36%	-5.26%	-7.71%	-9.80%	-12.16%	-14.43%
	1995 107.6	17.19%	16.26%	12.36%	9.29%	6.97%	4.83%	2.42%	0.00%	-2.97%	-5.48%	-7.62%	-10.04%	-12.36%
	1994 104.4	20.79%	19.83%	15.80%	12.64%	10.25%	8.05%	5.56%	3.07%	0.00%	-2.59%	-4.79%	-7.28%	-9.67%
	1993 101.7	23.99%	23.01%	18.88%	15.63%	13.18%	10.91%	8.36%	5.80%	2.65%	0.00%	-2.26%	-4.82%	-7.28%
	1992 99.4	26.86%	25.86%	21.63%	18.31%	15.79%	13.48%	10.87%	8.25%	5.03%	2.31%	0.00%	-2.62%	-5.13%
	1991 96.8	30.27%	29.24%	24.90%	21.49%	18.90%	16.53%	13.84%	11.16%	7.85%	5.06%	2.69%	0.00%	-2.58%
	1990 94.3	33.72%	32.66%	28.21%	24.71%	22.06%	19.62%	16.86%	14.10%	10.71%	7.85%	5.41%	2.65%	0.00%

Notes:

1 - Information based on Historical Cost Indexes values as provided in RS Means Building Construction Cost Data, 2002 edition.

2 - Values provided are general national building averages and do not reflect specific values for particular geographical regions or areas.

Construction Cost Indexes

Overall Inflation Rate:

'Year A'	to	'Year B'	%
1995	⇨	2002	17.193%
1996	⇨	2002	14.43%
1997	⇨	2002	11.79%
1998	⇨	2002	9.56%
1999	⇨	2002	7.23%
2000	⇨	2002	4.30%
2001	⇨	2002	0.80%
1995	⇨	1996	2.42%
1996	⇨	1997	2.36%
1997	⇨	1998	2.04%
1998	⇨	1999	2.17%
1999	⇨	2000	2.81%
2000	⇨	2001	3.47%
2001	⇨	2002	0.80%

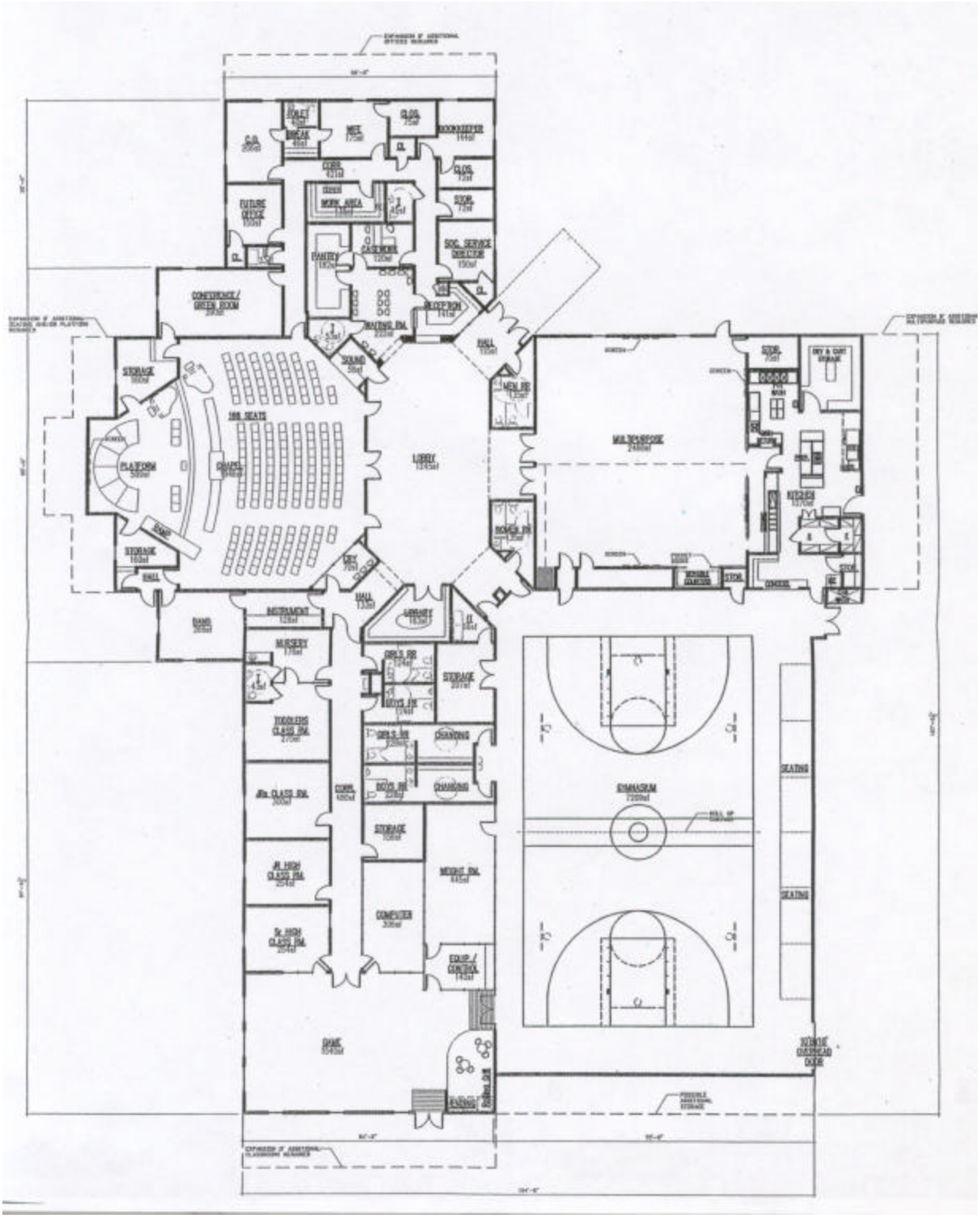
Notes:

1 - Information based on Historical Cost Indexes values as provided in RS Means Building Construction Cost Data, 2002 edition.

2 - Values provided are general national building averages and do not reflect specific values for particular geographical regions or areas.

APPENDIX C

THE PROTOTYPE DESIGN


CONFERENCE / DRESS ROOM
STORAGE
188 SEATS
PLATFORM
ORGAN
LOBBY
RECEPTION
CAFETERIA
KITCHEN
GYMNASIUM
SEATING
STAGE
CHANGING
STORAGE
CORR.
HALL
LIBRARY
NURSERY
TODDLERS CLASS RM.
Jr. CLASS RM.
JR. HIGH CLASS RM.
Sr. HIGH CLASS RM.
CONVEYOR
EQUIP. / CONTROL
MEDIC RM.
BAND
INSTRUMENT
OFFICE
WORK AREA
PANTRY
SOC. SERVICE DIRECTOR
STOR.
DRY & CURT STRAGE
OVERHEAD DOOR
POSSIBLE ADDITIONAL STORAGE

APPENDIX D

SPACE/ROOM DATA SHEET

SPACE/ROOM DATA SHEET

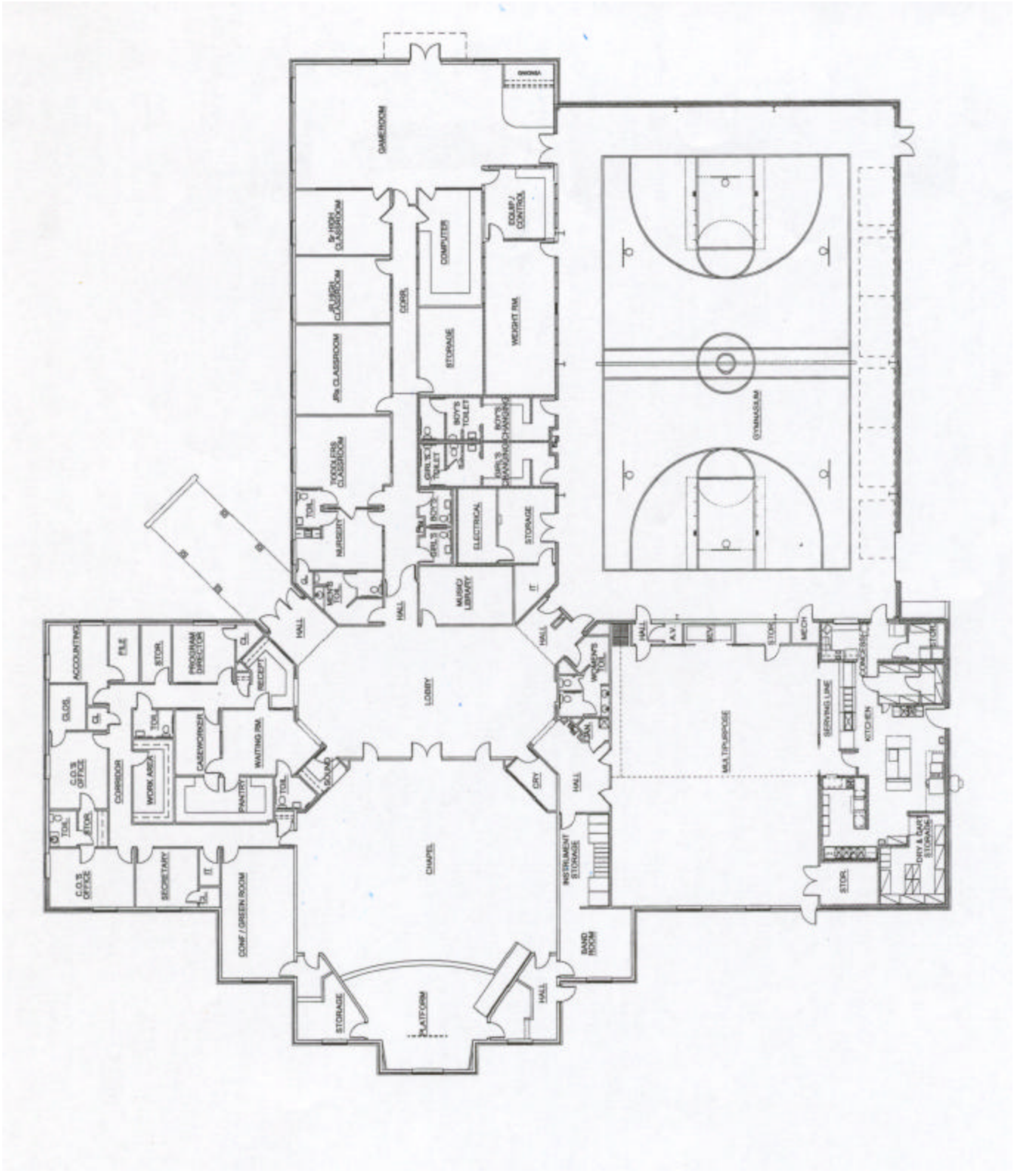
PROJECT: PROTOTYPE CORPS COMMUNITY CENTER

NUMBER OF SPACES LIKE THIS REQUIRED: _____

1. Use/Functional Component (Wing): _____
2. Name of Space: _____
3. Purpose: _____
4. Desired Floor Area (Net square feet): _____
5. Architectural Features:
    a. Ceiling Height: _____
    b. Suggested Materials For:
        Floor: _____
        Walls: _____
        Ceiling: _____
    c. Acoustical Requirements: _____
    d. Lighting Requirement: _____
    e. Other Special Requirements: _____
6. Systems and Utility Requirements:
    a. Telephones: _____
    b. Computer: _____
    c. Data Cabling: _____
    d. T.V./Cable/Satellite: _____
    e. Audio/Visual/Lighting: _____
    f. Distance Learning: _____
    g. Electrical: _____
    h. H.V.A.C.: _____
    i. Plumbing: _____
    j. Other: _____
7. Relationship to Other Areas: _____
8. Fixed Equipment: _____
9. Loose Equipment/Furniture: _____
10. Miscellaneous Equipment: _____
11. Comments: _____

APPENDIX E

THE COLUMBUS, GEORGIA MODEL


GAMEROOM
COMPUTER
EQUIP / CONTROL
WEIGHT RM
STORAGE
CORR.
JRs CLASSROOM
TODDLERS CLASSROOM
NURSERY
GIRL'S TOILET
BOY'S TOILET
BOY'S CHANGING
GIRL'S CHANGING
ELECTRICAL
STORAGE
MUSIC/ LIBRARY
IT
GYMNASIUM
LOBBY
CHAPEL
PLATFORM
MULTIPURPOSE
KITCHEN
SERVING LINE
BAND ROOM
INSTRUMENT STORAGE
CONF / GREEN ROOM
SECRETARY
C.O.S OFFICE
CORRIDOR
WORK AREA
CASEWORKER
WAITING RM
PANTRY
PROGRAM DIRECTOR
RECEPT
ACCOUNTING
FILE
STOR.
CLOS.
HALL
A.V.
MECH
DRY
BAR

APPENDIX F

OPERATIONS, MAINTENANCE, & CAPITAL PLAN OUTPUTS

Building Operations Plan Summary

Facility Information	
Facility Name	The Lovick P. Corn Worship and Community Center
Location	Warm Springs Rd & Academy;Columbus, GA
Type of Building	Community Worship
Owner	Salvation Army
Site Area	10.50 Acres
Building Area	26,140.00 Square Feet
Number of Floors	1 Story

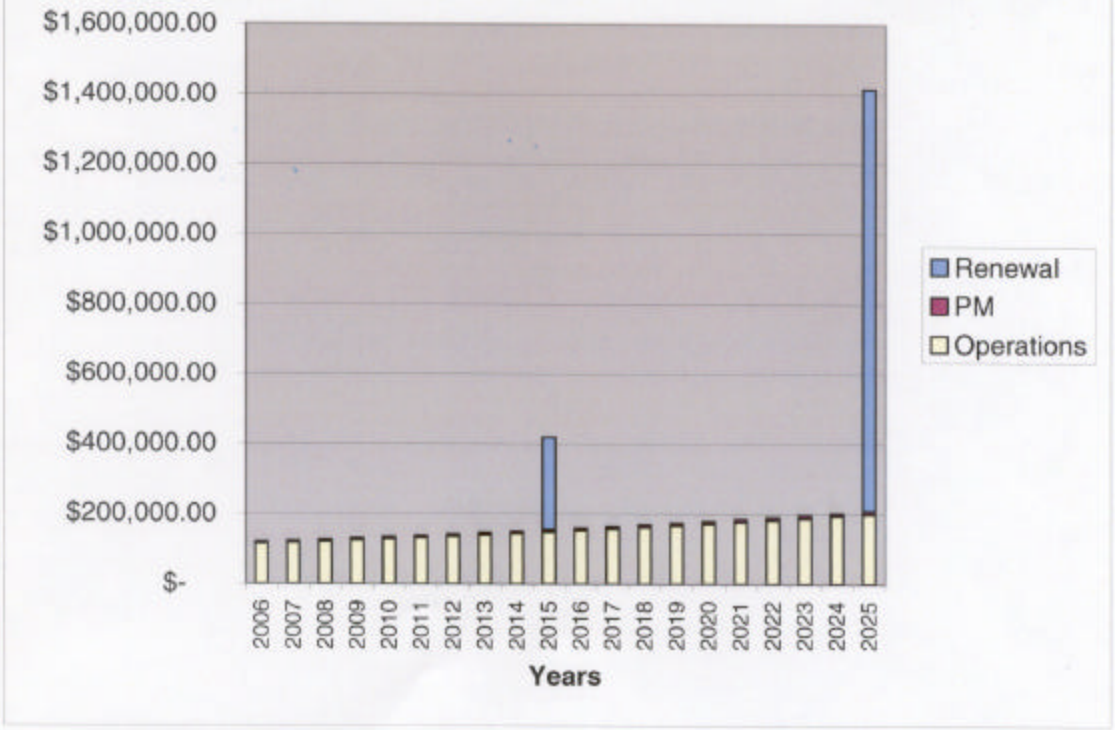
Study Parameters	
Replacement Cost	$ 3,602,924
Base Year	2005
Inflation Rate	3.00%
Study Term (Years)	50
Discount Rate	7.00%
Soft Cost Pct.	30.00%

SINKING FUND REQUIREMENTS

Total Funding Requirements	BOMA Life Cyle	% of Replacement	Adjusted Life Cycle	% of Replacement	Potential Savings
Capital Renewal	$ 2,168,987	60.20%	$ 1,356,518	37.65%	$ 812,469
Preventative Maint.	$ 121,532	3.37%	$ 121,532	3.37%	$ -
Interior Cleaning	$ 1,905,160	52.88%	$ 1,905,160	52.88%	$ -
Outside Maintenance	$ 652,247	18.10%	$ 652,247	18.10%	$ -
Utilities	$ -	0.00%	$ -	0.00%	$ -
TOTAL	**$ 4,847,925**	**134.56%**	**$ 4,035,456**	**112.01%**	**$ 812,469**

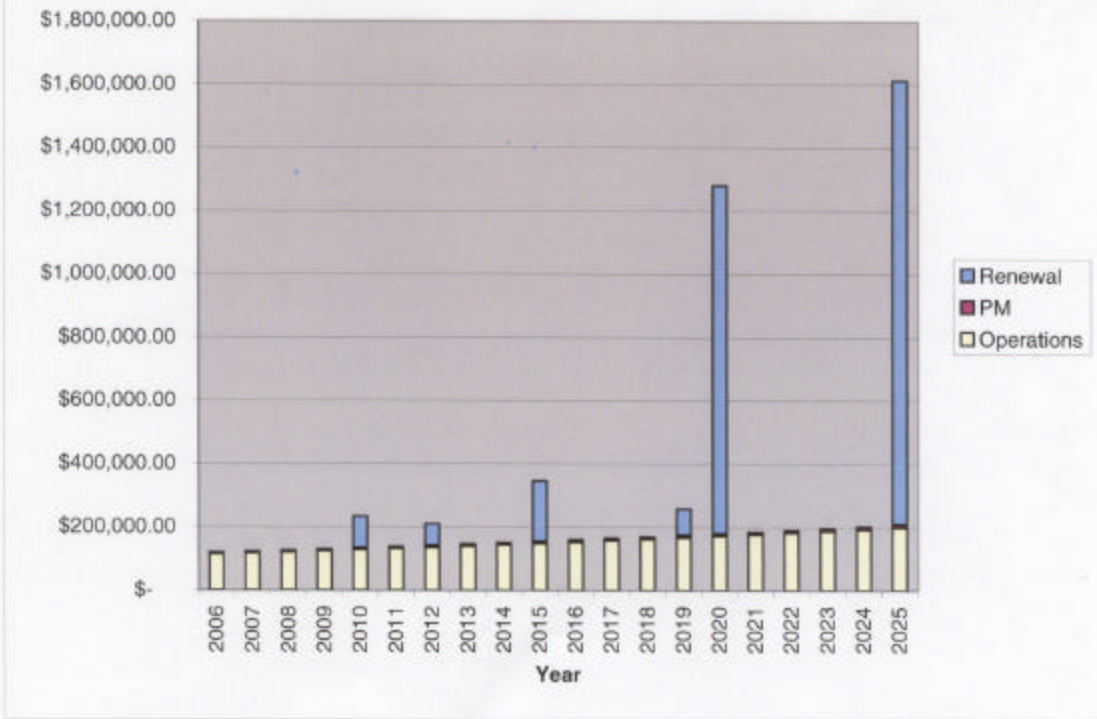
20 Year Budget Summary-Adjusted BOMA

Year:	Renewal	PM	Operations	Total	Annual $/SF
2006	$ -	$ 5,378.17	$ 113,173.06	$ 118,551.23	$ 4.54
2007	$ -	$ 5,539.52	$ 116,568.25	$ 122,107.77	$ 4.67
2008	$ -	$ 5,705.71	$ 120,065.30	$ 125,771.00	$ 4.81
2009	$ -	$ 5,876.88	$ 123,667.26	$ 129,544.13	$ 4.96
2010	$ -	$ 6,053.18	$ 127,377.27	$ 133,430.46	$ 5.10
2011	$ -	$ 6,234.78	$ 131,198.59	$ 137,433.37	$ 5.26
2012	$ -	$ 6,421.82	$ 135,134.55	$ 141,556.37	$ 5.42
2013	$ -	$ 6,614.48	$ 139,188.59	$ 145,803.06	$ 5.58
2014	$ -	$ 6,812.91	$ 143,364.24	$ 150,177.15	$ 5.75
2015	$ 264,177.29	$ 7,017.30	$ 147,665.17	$ 418,859.76	$ 16.02
2016	$ -	$ 7,227.82	$ 152,095.13	$ 159,322.94	$ 6.09
2017	$ -	$ 7,444.65	$ 156,657.98	$ 164,102.63	$ 6.28
2018	$ -	$ 7,667.99	$ 161,357.72	$ 169,025.71	$ 6.47
2019	$ -	$ 7,898.03	$ 166,198.45	$ 174,096.48	$ 6.66
2020	$ -	$ 8,134.97	$ 171,184.40	$ 179,319.38	$ 6.86
2021	$ -	$ 8,379.02	$ 176,319.94	$ 184,698.96	$ 7.07
2022	$ -	$ 8,630.39	$ 181,609.53	$ 190,239.93	$ 7.28
2023	$ -	$ 8,889.30	$ 187,057.82	$ 195,947.12	$ 7.50
2024	$ -	$ 9,155.98	$ 192,669.55	$ 201,825.54	$ 7.72
2025	$ 1,206,514.63	$ 9,430.66	$ 198,449.64	$ 1,414,394.93	$ 54.11



20 Year Budget Summary-BOMA

Year:	Renewal	PM	Operations	Total	Annual $/SF
2006	$ -	$ 5,378.17	$ 113,173.06	$ 118,551.23	$ 4.54
2007	$ -	$ 5,539.52	$ 116,568.25	$ 122,107.77	$ 4.67
2008	$ -	$ 5,705.71	$ 120,065.30	$ 125,771.00	$ 4.81
2009	$ -	$ 5,876.88	$ 123,667.26	$ 129,544.13	$ 4.96
2010	$ 99,307.38	$ 6,053.18	$ 127,377.27	$ 232,737.84	$ 8.90
2011	$ -	$ 6,234.78	$ 131,198.59	$ 137,433.37	$ 5.26
2012	$ 66,997.65	$ 6,421.82	$ 135,134.55	$ 208,554.02	$ 7.98
2013	$ -	$ 6,614.48	$ 139,188.59	$ 145,803.06	$ 5.58
2014	$ -	$ 6,812.91	$ 143,364.24	$ 150,177.15	$ 5.75
2015	$ 190,677.44	$ 7,017.30	$ 147,665.17	$ 345,359.91	$ 13.21
2016	$ -	$ 7,227.82	$ 152,095.13	$ 159,322.94	$ 6.09
2017	$ 307.35	$ 7,444.65	$ 156,657.98	$ 164,409.99	$ 6.29
2018	$ -	$ 7,667.99	$ 161,357.72	$ 169,025.71	$ 6.47
2019	$ 82,398.66	$ 7,898.03	$ 166,198.45	$ 256,495.14	$ 9.81
2020	$ 1,100,254.86	$ 8,134.97	$ 171,184.40	$ 1,279,574.24	$ 48.95
2021	$ -	$ 8,379.02	$ 176,319.94	$ 184,698.96	$ 7.07
2022	$ -	$ 8,630.39	$ 181,609.53	$ 190,239.93	$ 7.28
2023	$ -	$ 8,889.30	$ 187,057.82	$ 195,947.12	$ 7.50
2024	$ -	$ 9,155.98	$ 192,669.55	$ 201,825.54	$ 7.72
2025	$ 1,404,979.55	$ 9,430.66	$ 198,449.64	$ 1,612,859.85	$ 61.70



The Lovick P. Corn Worship and Community Center

Major Equipment Listing

Item	Mark	Area	Manufacturer	Model
Roof Top HVAC	RTU-1	Office Area	Carrier	48TMD012
Roof Top HVAC	RTU-2	Chapel	Carrier	48TMD028
Roof Top HVAC	RTU-3	Multi Purpose	Carrier	48TMD020
Roof Top HVAC	RTU-4	Gymnasium	Carrier	48TMD025
Roof Top HVAC	RTU-5	Int. Classrooms	Carrier	48TMD006
Roof Top HVAC	RTU-6	Ext. Classrooms	Carrier	48TMD012
Fan Coil Unit	FCU-1	Computer Room	Carrier	FB4ANF018
Heat Pump	HP-1	Computer Room	Carrier	38YCC018
Exhaust Fan	EF-1	Office Area	Cook	ACE-D
Exhaust Fan	EF-2	Dish Hood	Cook	SRSH-B
Exhaust Fan	EF-3	Kitchen Hood	Cook	VCR-HP
Exhaust Fan	EF-4	Classrooms	Cook	ACE-B
Makeup Air Unit	MAU-1	Kitchen	Greenheck	1GX-112
Gas Water Heater	GWH-1	Water Heater Room	A.O. Smith	BTH-199
Gas Water Heater	GWH-2	Water Heater Room	A.O. Smith	BTH-199
Hot Water Circulating Pump	HWCP	Water Heater Room	B&G	PL-55

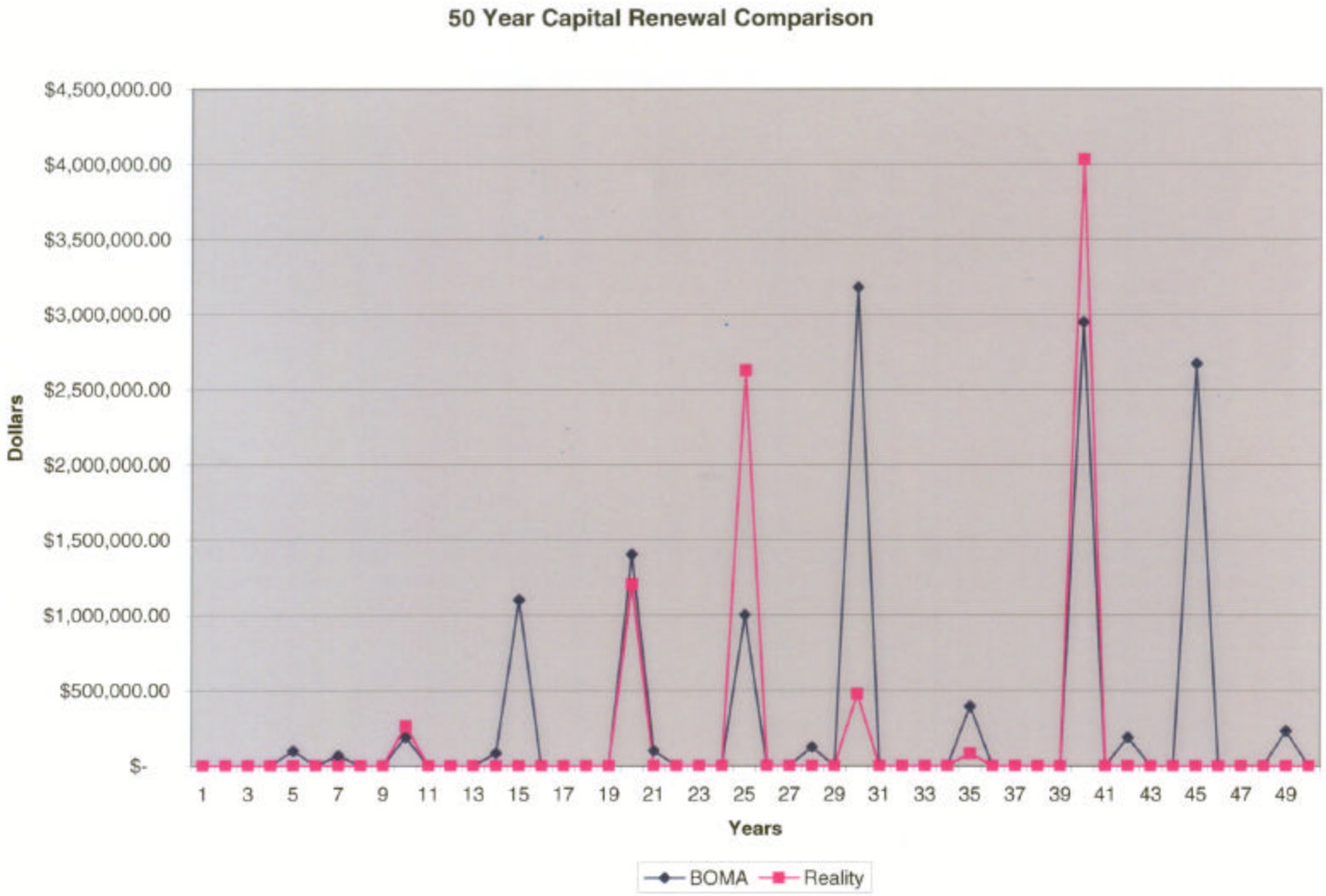
Location:_____

PM 8.4-810-1950 Quantity: 6 Package Unit, Air Cooled, 3 Tons thru 24 Tons

Procedure	W	M	Q	S	A
Check with operating or area personnel for deficiencies.					
Check tension, condition, alignment of belts; adjust as necessary.					
Lubricate shaft and motor bearings.					
Replace air filters.					
Clean electrical wiring and connections; tighten loose connections.					
Clean coils, evaporator drain pan, blowers, fans, motors and drain piping as required.					
Perform operational check of unit; make adjustments on controls and other components as required.					
During operation of unit, check refrigerant pressure; add refrigerant as necessary.					
Check compressor oil level; add oil as required.					
Clean area around unit.					
Fill out maintenance checklist and report deficiencies.					

Notes/Comments:

Date:_____ Technician:_____


50 Year Capital Renewal Comparison
$4,500,000.00
$4,000,000.00
$3,500,000.00
$3,000,000.00
$2,500,000.00
$2,000,000.00
$1,500,000.00
$1,000,000.00
$500,000.00
$-
Dollars
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49
Years
BOMA
Reality

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